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Physical, Hydrological, Chemical and Meteorological Data from the Arctic Char Project, Nauyuk Lake, Northwest Territories

E. C. Gyselman and L. Mohr

Central and Arctic Region
Department of Fisheries and Oceans
Winnipeg, Manitoba R3T 2N6

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Canadian Data Report of
Fisheries and Aquatic Sciences 790

June 1990

PHYSICAL, HYDROLOGICAL, CHEMICAL AND METEOROLOGICAL DATA FROM THE ARCTIC CHARR PROJECT, NAUYUK LAKE, NORTHWEST TERRITORIES

by

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ABSTRACT

Gyselman, E.C., and L. Mohr. 1990. Physical, hydrological, chemical and meteorological data from the Arctic Charr Project, Nauyuk Lake, Northwest Territories. Can. Data Rep. Fish. Aquat. Sci. 790: iv + 73 p.

The Arctic Charr Project was a long term (1972 - 1988) research program on the population dynamics of Arctic charr (Salvelinus alpinus) carried out at Nauyuk Lake in the central Canadian Arctic by the Department of Fisheries and Oceans. This report presents the physical, hydrological, chemical and meteorological data that were measured during the course of the project.

Key words: experimental fishing; Arctic charr; Salvelinus alpinus; population dynamics; harvest rates; test netting; fishery management; Northwest Territories.

RÉSUMÉ

Gyselman, E.C., and L. Mohr. 1990. Physical, hydrological, chemical and meteorological data from the Arctic Charr Project, Nauyuk Lake, Northwest Territories. Can. Data Rep. Fish. Aquat. Sci. 790: iv + 73 p.

Le Projet sur l'omble chevalier était un programme de recherche à long terme (1972-1988) sur la dynamique de la population des ombles chevaliers (Salvelinus alpinus) réalisé par le ministère des Pêches et Océans. Ce projet a eu lieu dans le lac Nauyuk situé dans la partie centrale de l'Arctique canadien. Dans ce rapport, on présente les données physiques, hydrologiques, chimiques et météorologiques obtenues au cours de ce projet.

Mots-clés: pêche expérimentale; omble chevalier; Salvelinus alpinus; dynamique des populations; taux de récolte; filet test; gestion des pêches; Territoires du Nord-Quest.

INTRODUCTION

The Arctic Charr Project was initiated in 1972 by the Fisheries Research Board of Canada, now part of the Department of Fisheries and Oceans. The program was a long term investigation on the population dynamics of the Arctic charr, Salvelinus alpinus. At the time of its inception no comprehensive, long term research program had been done on this species in spite of its relatively high social and economic importance to the indigenous people of the Canadian arctic.

The head research scientist for the project, Dr. Lionel Johnson, decided that one river system with a workable population size of anadromous charr would be selected and studied intensively. Ideally, this population would be in a pristine state and free from human exploitation. In 1973, an extensive survey of the river systems around the community of Cambridge Bay on Victoria Island and Melville Sound, Elu Inlet and western Bathurst Inlet on the mainland was carried out in an attempt to find a suitable river system. The site at Nauyuk Lake (lat. 68°22'N, long. 107° 43'W) at the head of Parry Bay on the Kent Peninsula was eventually selected (Fig. 1). The research program ran continuously from 1974 until 1980. Specific facets of the program were again investigated in 1984 and 1988.

As part of the background information needed for this study, physical, chemical, hydrological and meteorological measurements were made at various times from 1974 until 1980. These data are reported in this publication.

METHODS AND RESULTS

LAKE MORPHOMETRY

The Arctic Charr Project actually included a number of lakes that were either part of the Nauyuk Lake drainage system or in the immediate vicinity of the field camp (Fig. 1). Nauyuk Lake and Willow Lake were both used by an anadromous charr stock. The smaller lakes, Gavia, Little Nauyuk and Notgordie, were landlocked and contained only non-anadromous charr.

Outline maps were drawn from aerial photographs obtained from the Federal Department of Energy Mines and Resources. Only the central portions of each photograph were used to minimize the effects of spherical aberration. Bathymetric maps were drawn using the outlines maps and depth contour transects created by a Furuno model FG200 Mark III depth sounder. Morphometric data were calculated from the depth contour maps.

The bathymetry of the study lakes is shown in Fig. 2 and Fig. 4-6. The bathymetry of Willow Lake was never done because most of lake was shallower than the reading capability of the depth sounder. However, an outline map is shown in Fig. 3.

HYDROLOGY

Nauyuk Lake drains into Parry Bay via the Nauyuk River and the anadromous charr use this river as the route to the marine environment. The mean daily water levels in Nauyuk Lake at the outlet to the Nauyuk River are given in Tables 2 and 3 for 1977 and 1978 respectively.

Discharge rates were calculated from stream profile and flow rates. The mean daily discharge rates for the Nauyuk River for 1977 through 1979 are presented in tabular form in Tables 4-6 and graphic form in Fig. 7-9.

WATER TEMPERATURES

From 1974 until 1977, surface water temperatures were recorded at the head of the Nauyuk River and at the head of Willow Creek, which connects Willow Lake to Nauyuk Lake, using Weksler model 06M1C58 continuous recording thermometers.

Tables 7-10 present the daily maximum and minimum temperatures for the Nauyuk River and Tables 11-14 for Willow Creek. The data is also presented in graphic form in Fig. 10-13 for Nauyuk Lake and Fig. 14-17 for Willow Creek.

WATER CHEMISTRY

Dissolved oxygen and temperature profiles were done at the deepest location in Nauyuk Lake, station #002 (Fig. 1), throughout the 1974 to 1978 field seasons. Similarly, profiles were done at the deepest spot in Little Nauyuk Lake from 1975 to 1979 and Gavia Lake from 1977 to 1979. From 1974 until 1976 oxygen was measured using a YSI model 51A meter. Starting in 1977, a standard iodometric method was used (APHA 1975). Water temperature was measured using the temperature probe on the YSI meter.

Temperature, oxygen and percent oxygen saturation profiles are given for Nauyuk Lake station #002 in Fig. 18-25, for Little Nauyuk Lake in Fig. 26-30 and Gavia Lake in Fig. 31-33.

Water samples were collected for analysis of chemical components on 2 occasions, 12 July 1974 and 3 March 1975, from various sites on Nauyuk Lake. The analyses were done by the Chemistry Analysis Unit at the Freshwater Institute. These data are summarized in Tables 15 and 16.

METEOROLOGY

The Atmospheric Environment Service of Environment Canada established a weather station at the Nauyuk Lake field camp in 1976. Daily records were maintained from 1976 until 1979.

Temperatures were recorded using calibrated 'Zeal' maximum and minimum thermometers. The daily maximum and minimum temperatures for 1976 to 1977 are given in Tables 17-19.

Barometric pressure was continuously recorded on a recording barometer calibrated to sea level. Daily barometric pressures at 1800 GMT (1200 MDT) for 1977 to 1979 are given in Tables 20-22.

Total daily precipitation readings for 1976 to 1978 are given in Tables 23-25.

Wind speed was recorded at 6 hour intervals each day using a calibrated 'Werkprufschein' anemometer. The mean of these recordings and the principal wind direction for 1976 to 1978 are given in Tables 26-28.

Cloud cover was recorded in tenths at 6 hour intervals. The daily mean of these readings for 1977 and 1978 are given in Tables 29-30.

In 1977 and 1978, solar radiation was continuously recorded on a 'Belfort' pyranometer. The total daily solar radiation is given in Tables 31-32.

Daily total hours of bright sunshine were recorded on a set of 'Campbell-Stokes, Arctic Type' sunshine recorders in 1977. The data are shown in Table 33.

ACKNOWLEDGMENTS

The authors would like to thank the many technicians and summer students who patiently collected the data presented here. Often conditions were less than ideal but invariably the measurements were taken with precision as well as good humour.

Dr. Lionel Johnson has been the driving force behind the Arctic Charr project for 20 years and deserves recognition for his scientific excellence as well as valued friendship.

The authors thank the reviewers, Dr. H. E. Welch and Dale McGowan for their critique of this report.

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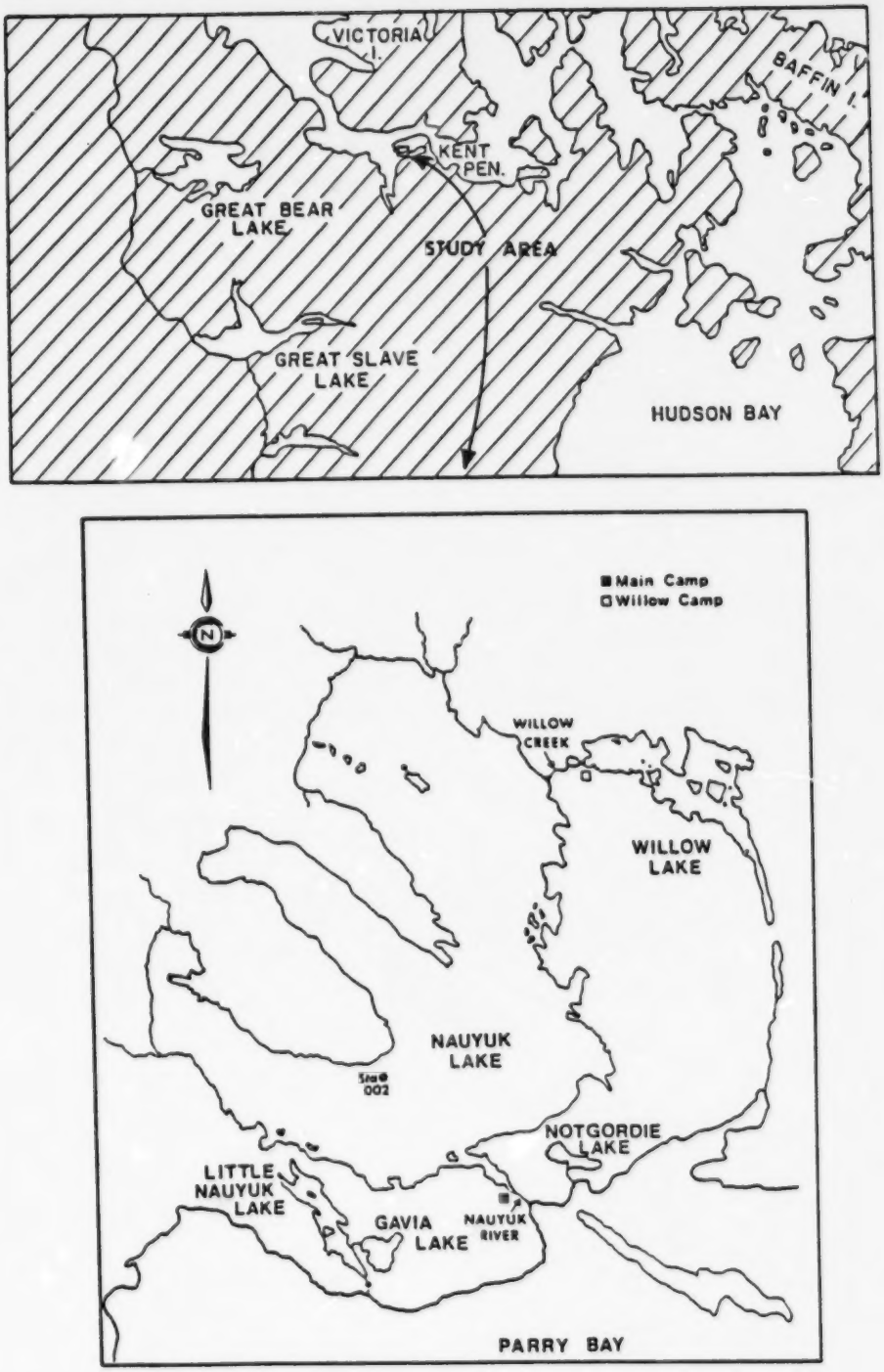

Figure 1. Nauyuk Lake study area.

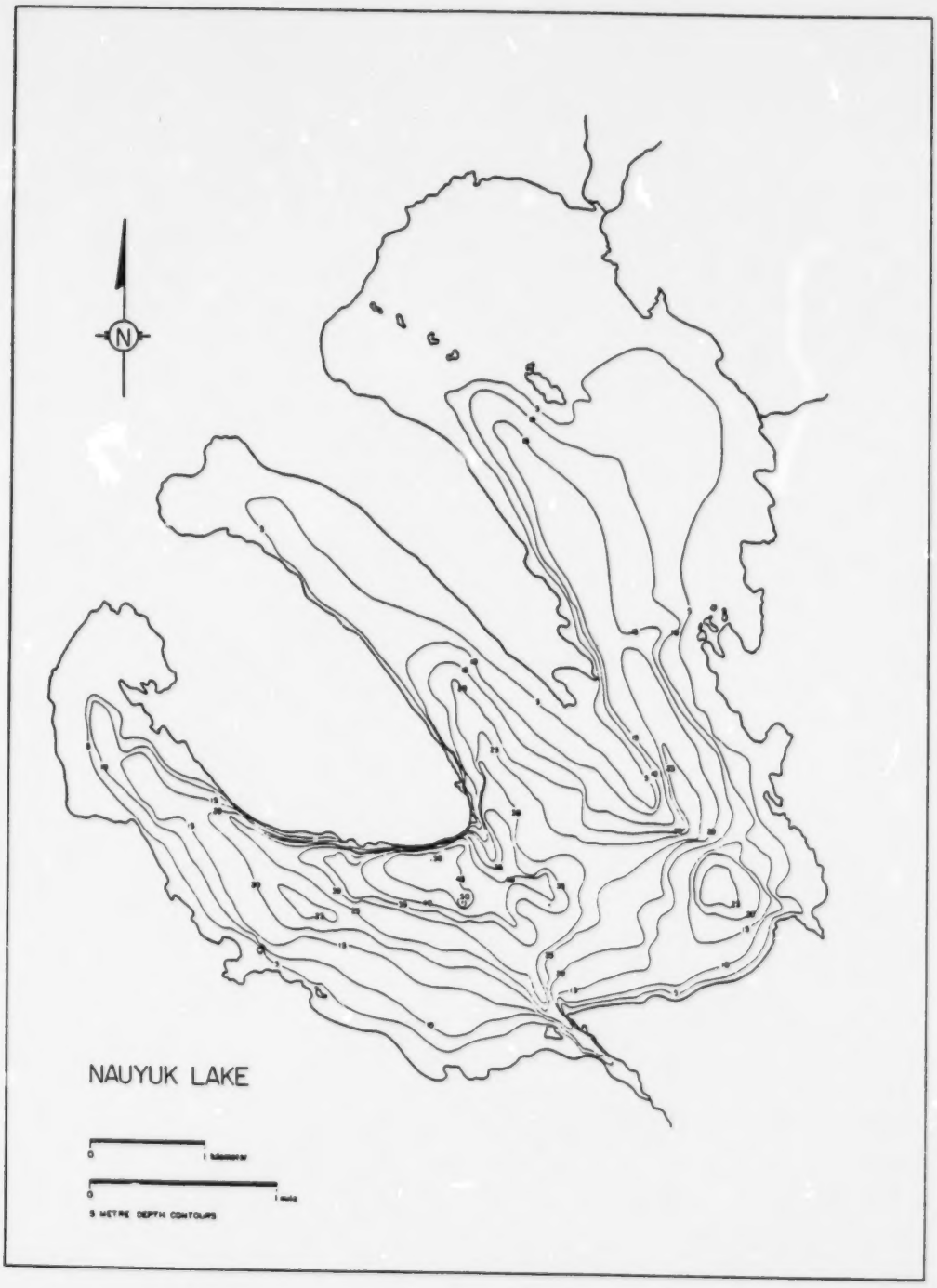

Figure 2. Bathymetric map of Nauyuk Lake.

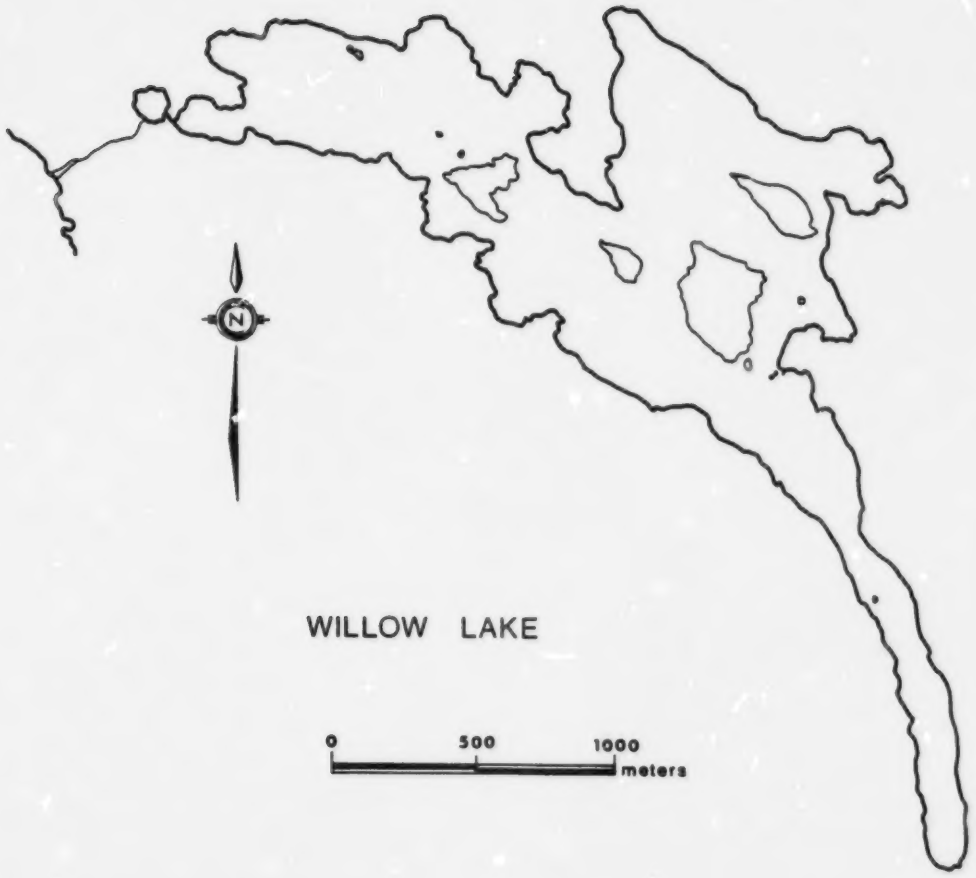

Figure 3. Outline map of Willow Lake.

Figure 4. Bathymetric map of Little Nauyuk Lake.

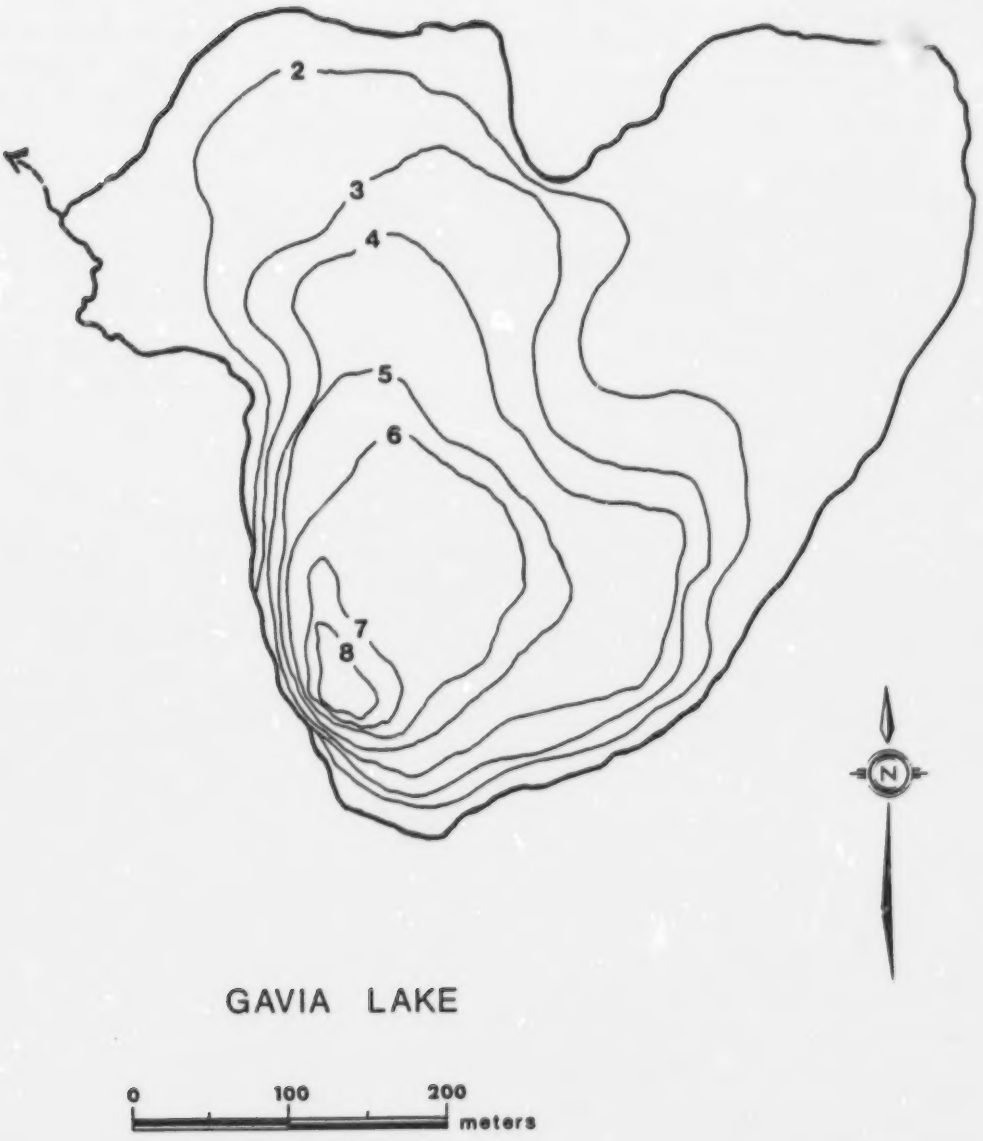

Figure 5. Bathymetric map of Gavia Lake.

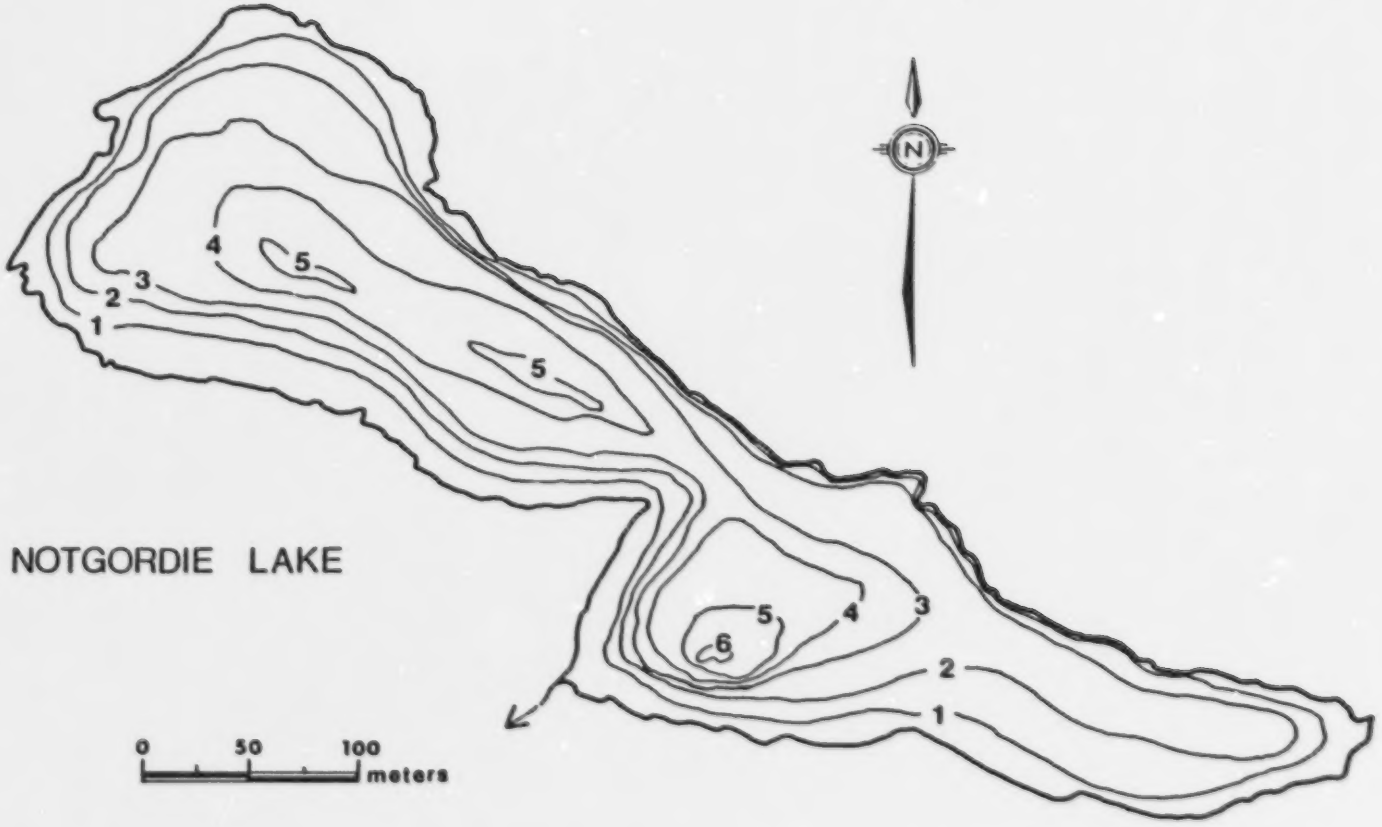

Figure 6. Bathymetric map of Notgordie Lake.

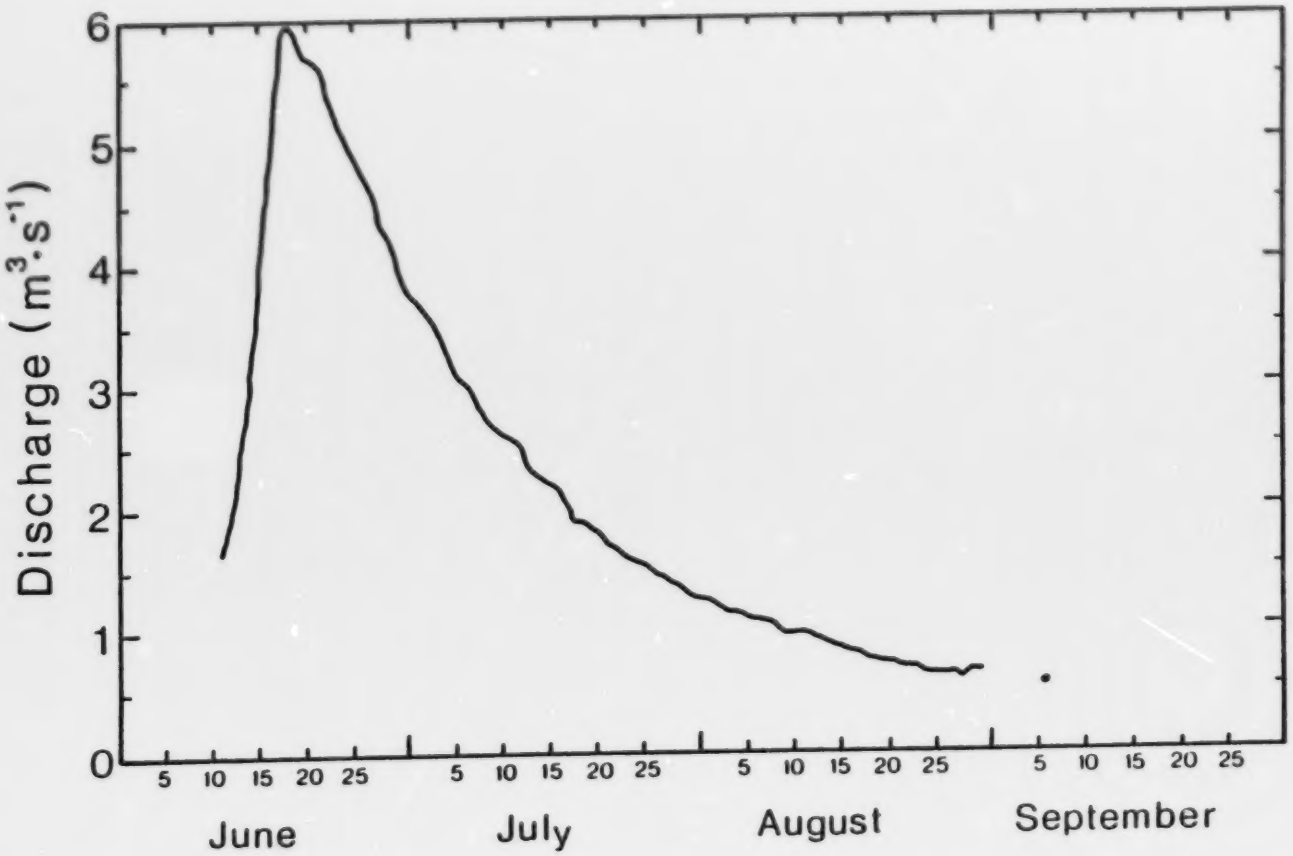

Figure 7. Mean daily discharge rates from Nauyuk Lake, 1977.

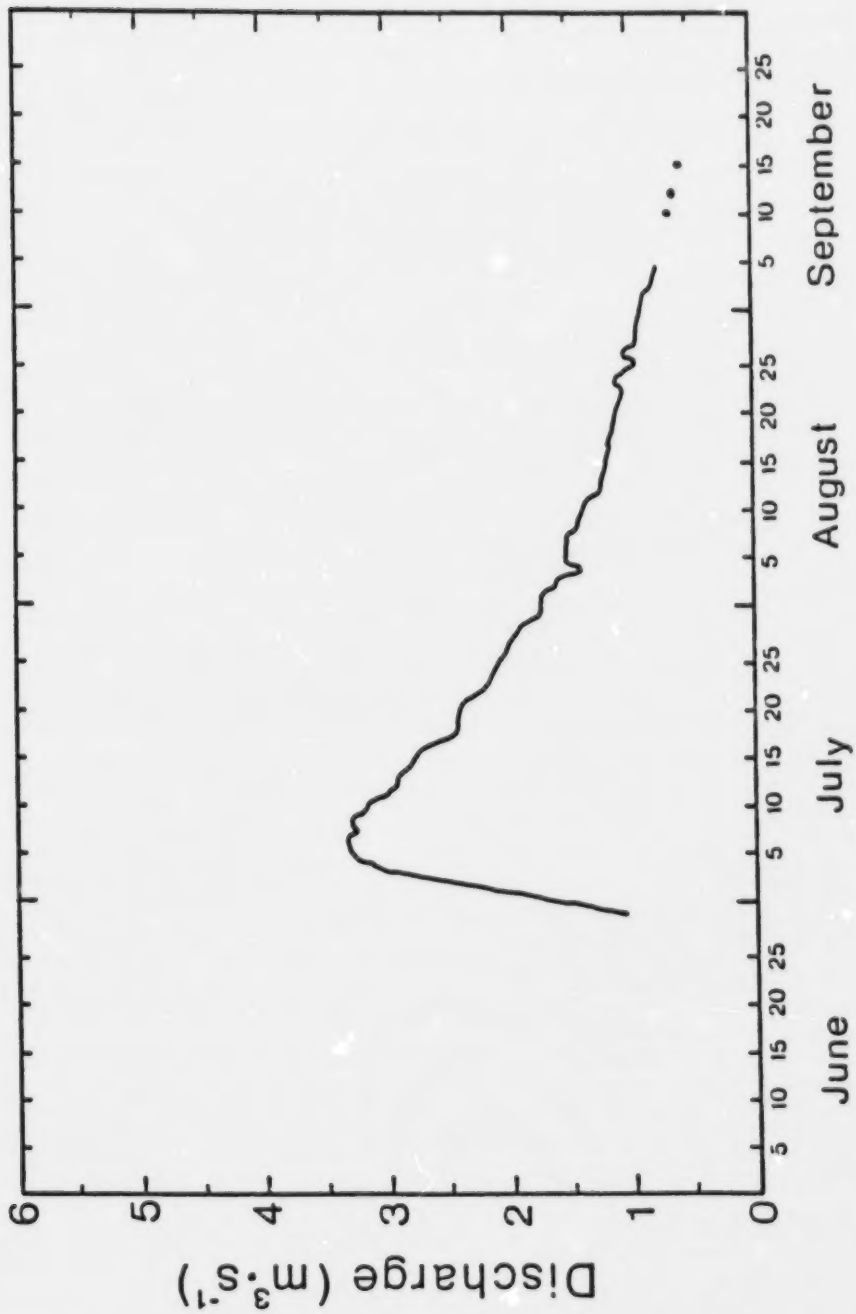

Figure 8. Mean daily discharge rates from Nauyuk Lake, 1978.

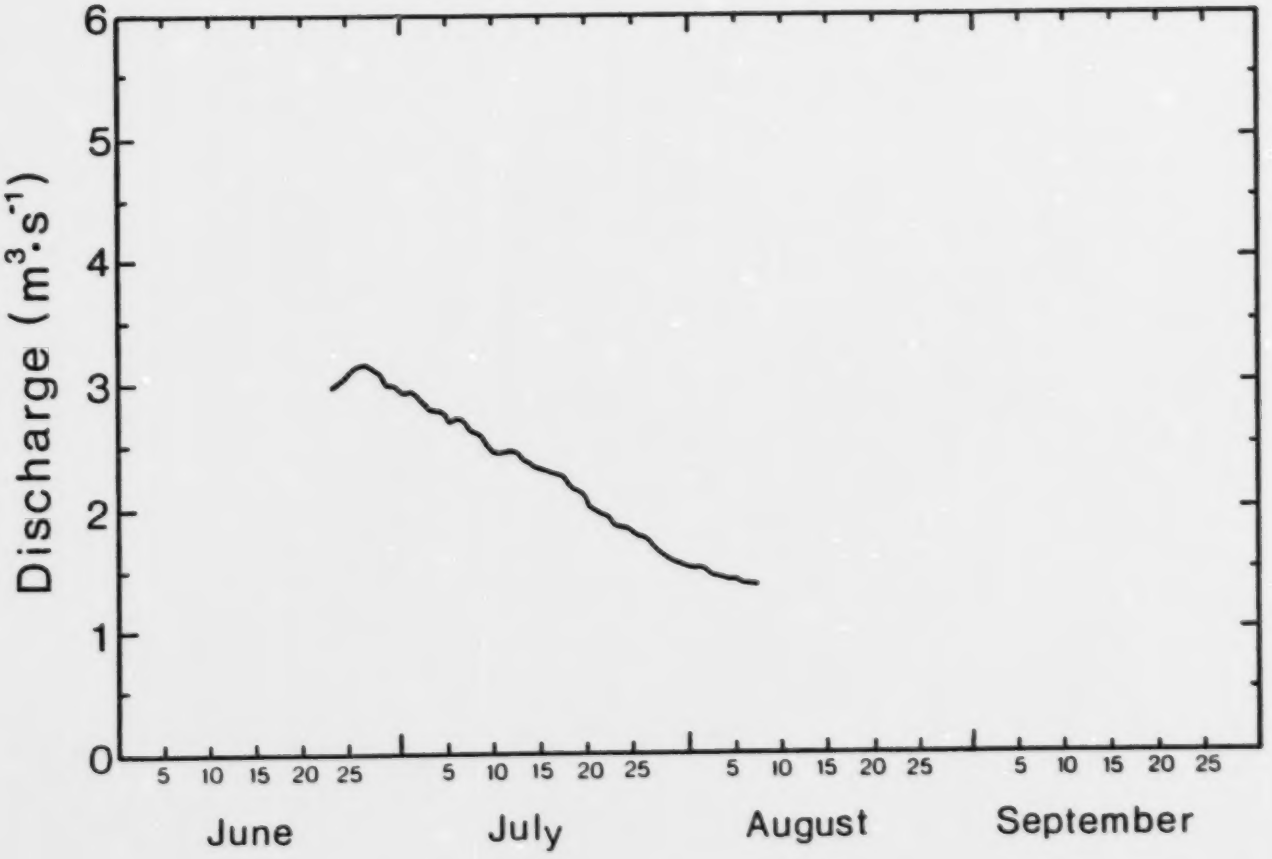

Figure 9. Mean daily discharge rates from Nauyuk Lake, 1979.

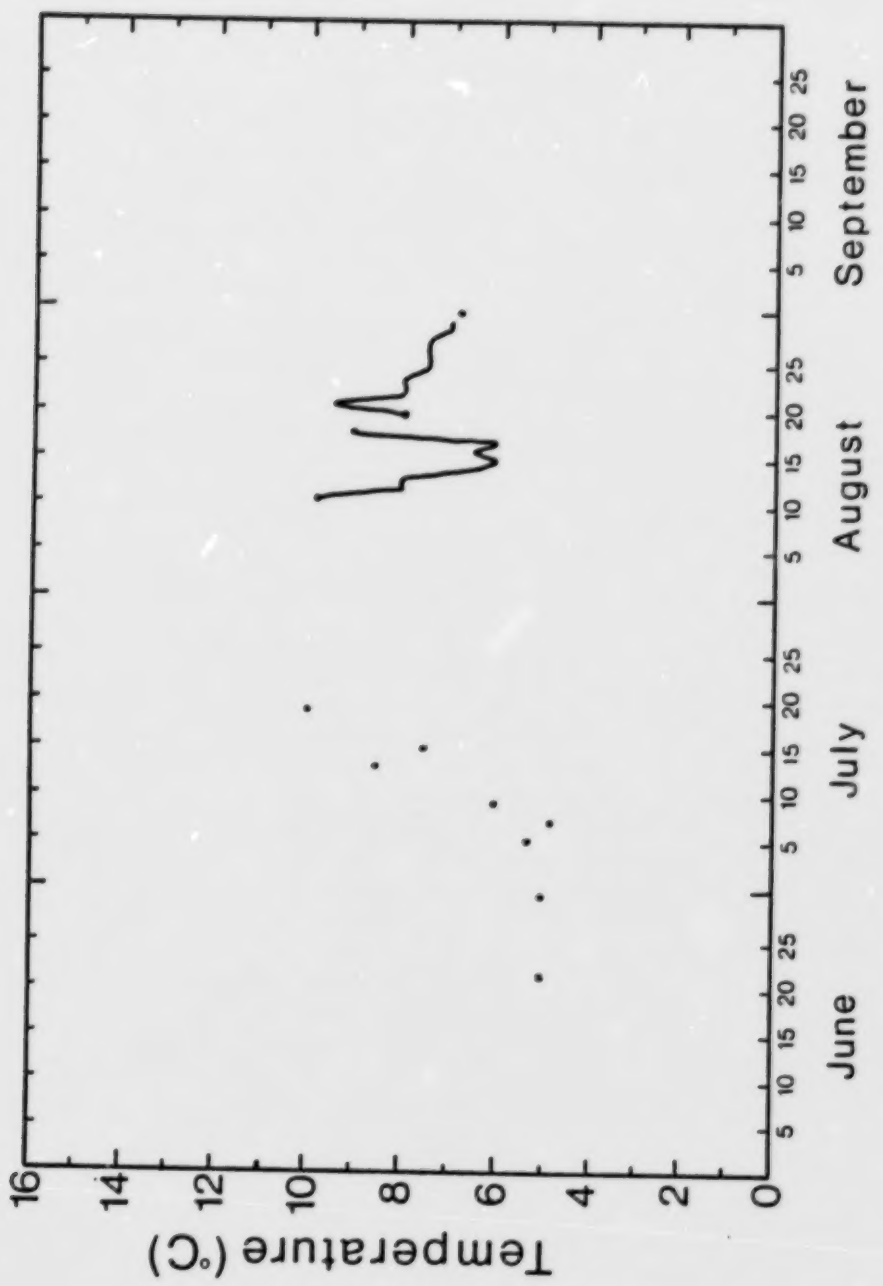

Figure 10. Maximum and minimum daily surface water temperatures for the Nauyuk River, 1974. (———) Max. (- - - - -) Min.

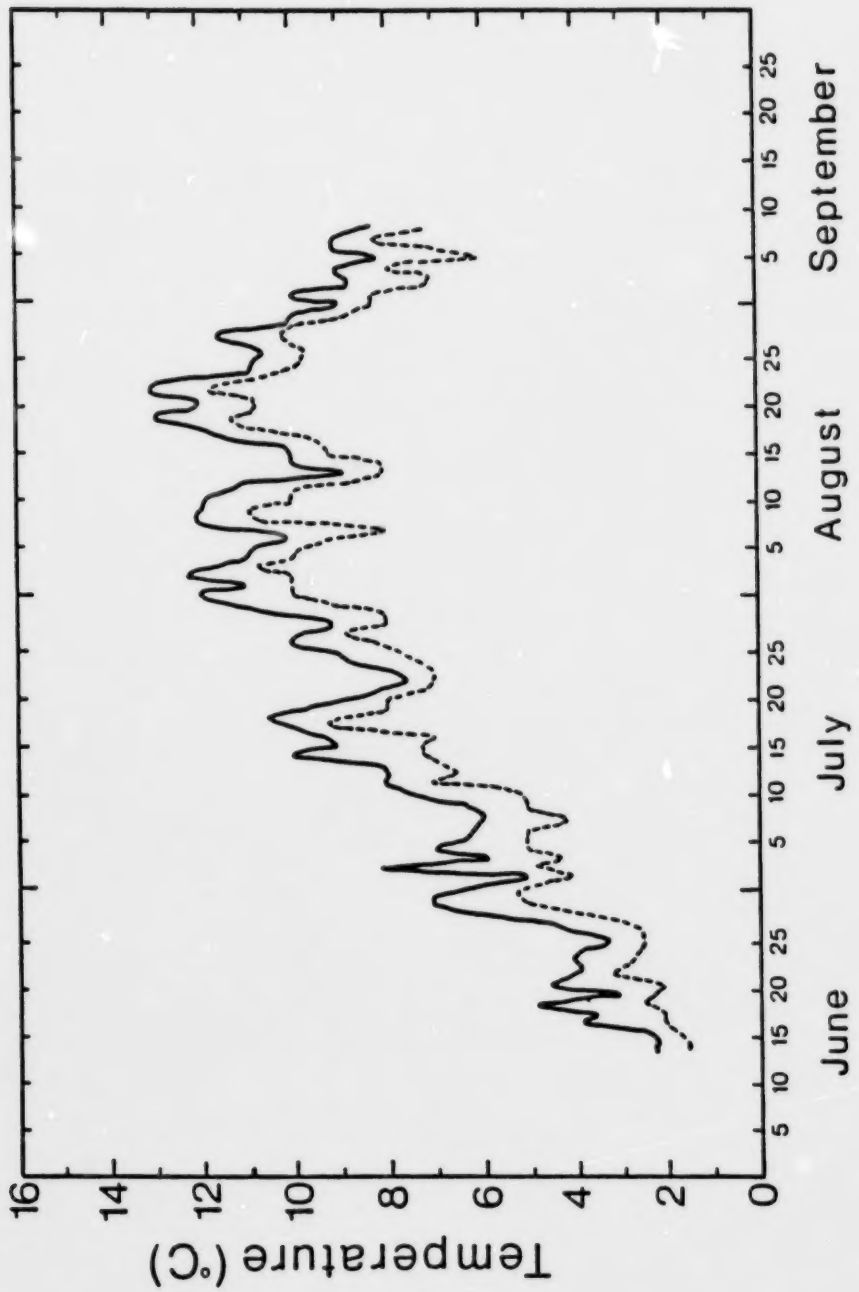

Figure 11. Maximum and minimum daily surface water temperatures for the Nauyuk River, 1975. (———) Max. (– – – –) Min.

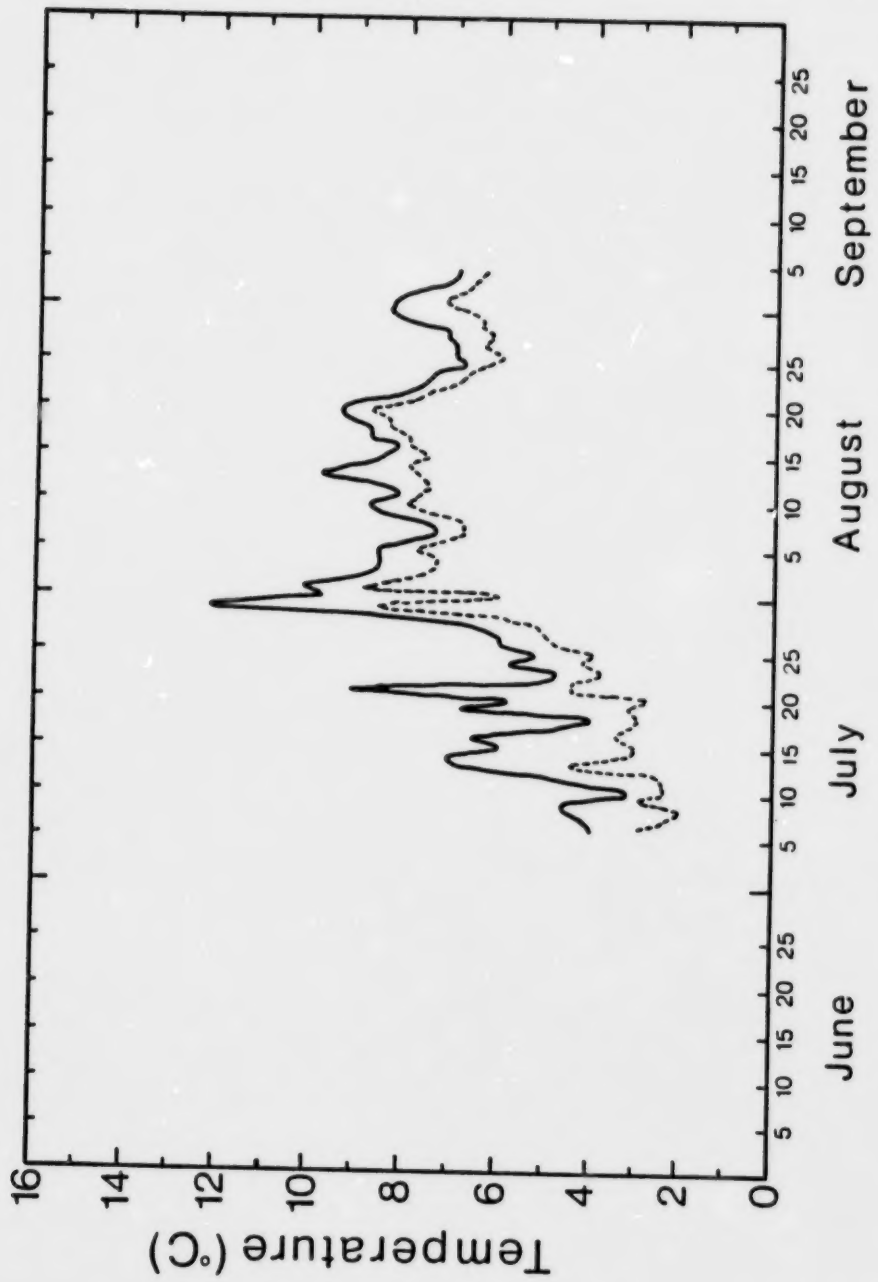

Figure 12. Maximum and minimum daily surface water temperatures for the Nauyuk River, 1976. (———) Max. (- - - -) Min.

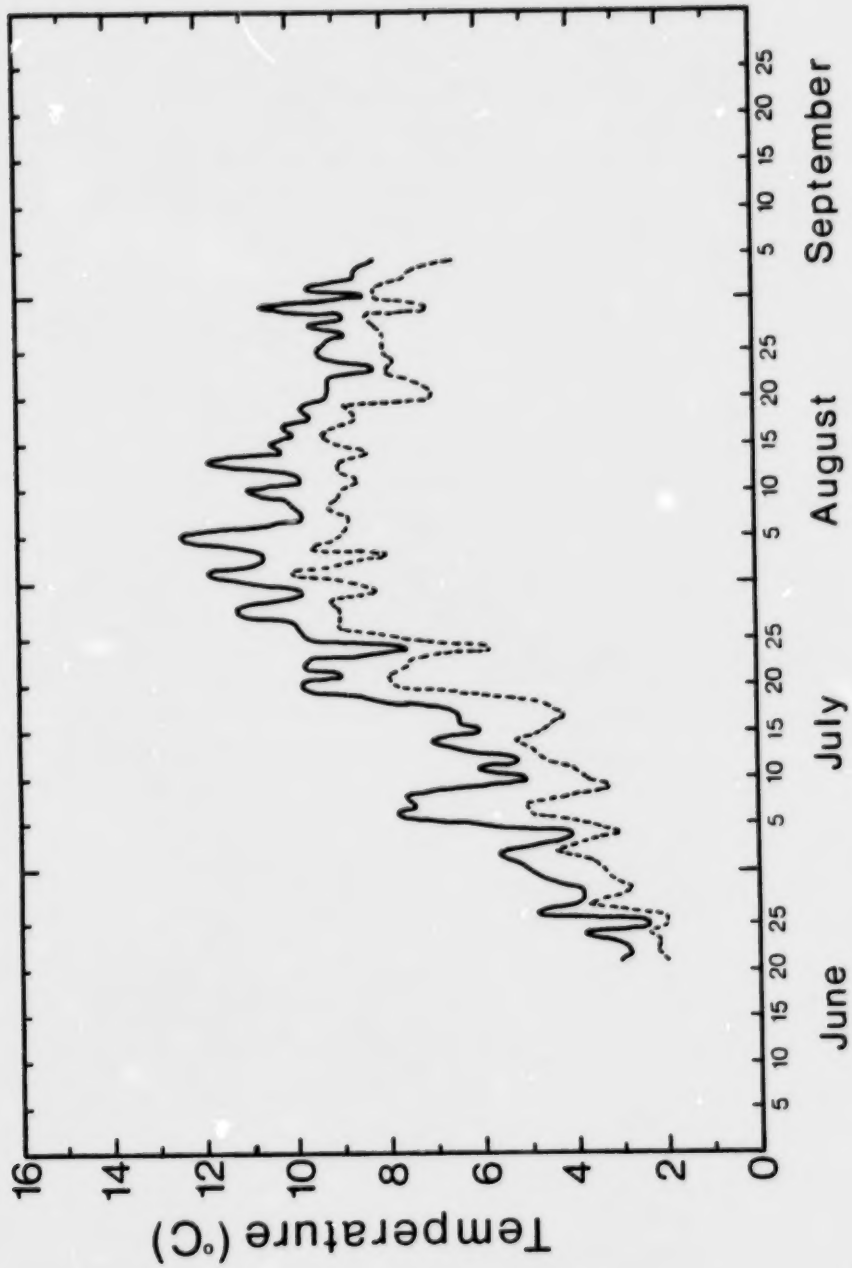

Figure 13. Maximum and minimum daily surface water temperatures for the Nauyuk River, 1977. (———) Max. (- - - - -) Min.

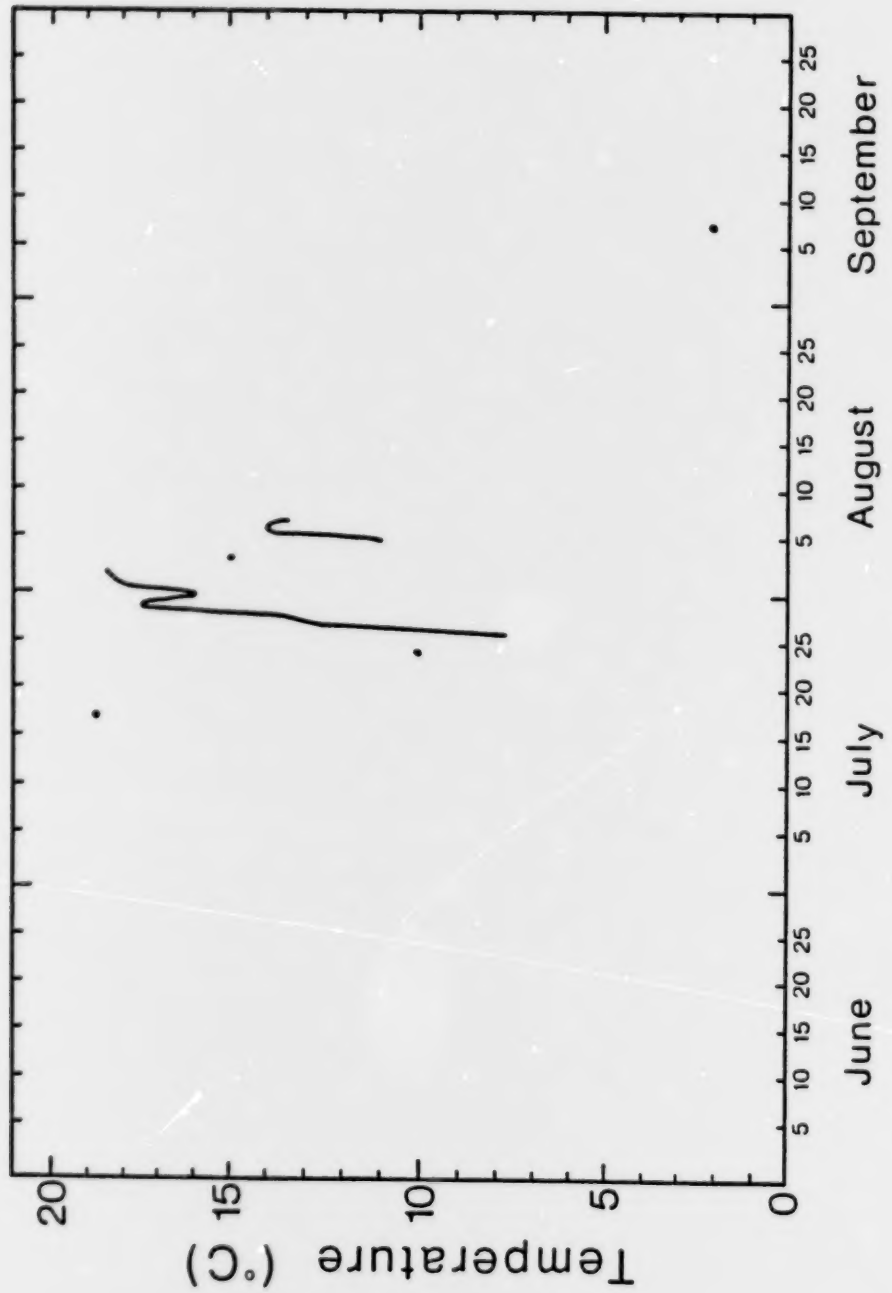

Figure 14. Maximum and minimum daily surface water temperatures for the Willow Creek, 1974. (——) Max. (- - - -) Min.

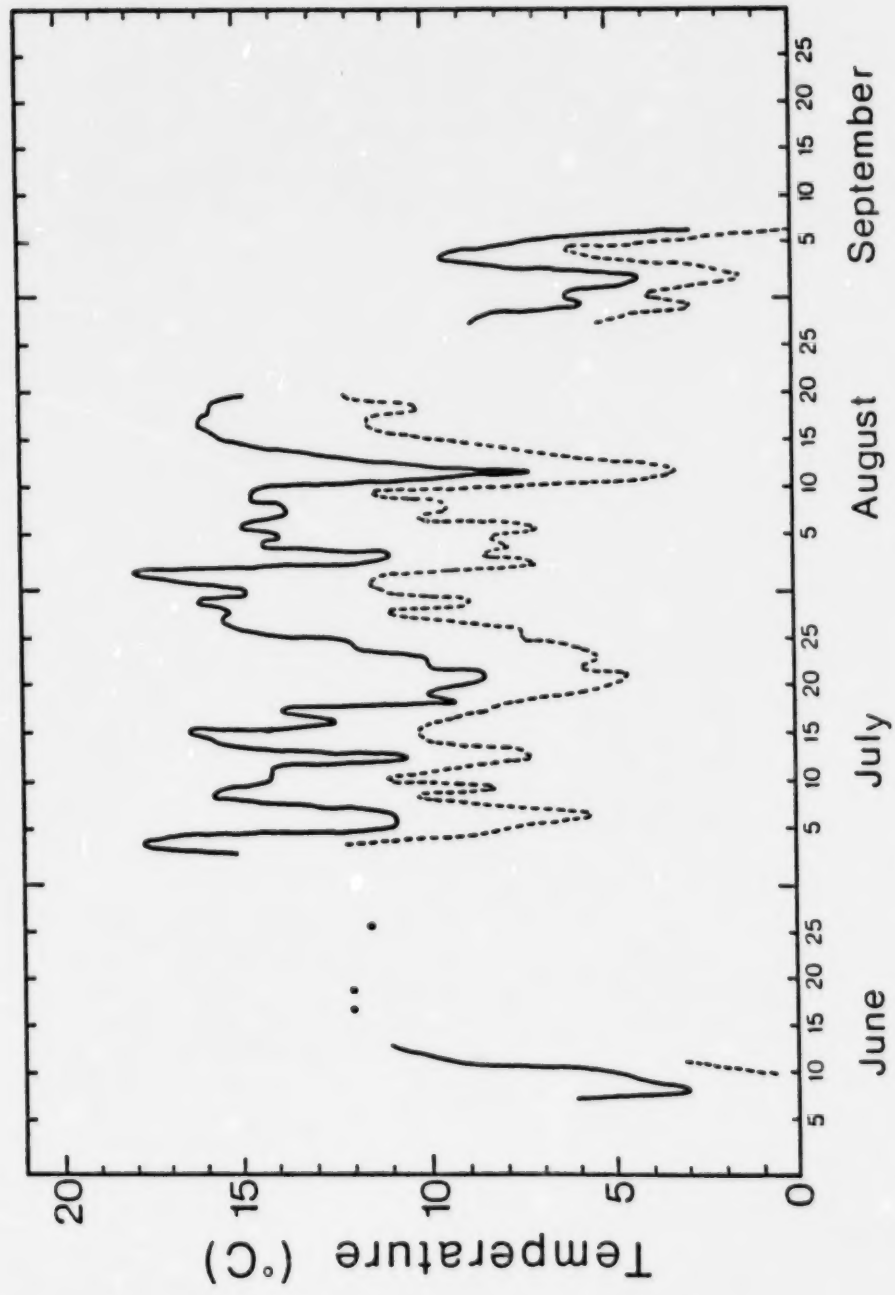

Figure 15. Maximum and minimum daily surface water temperatures for the Willow Creek, 1975. (——) Max. (-----) Min.

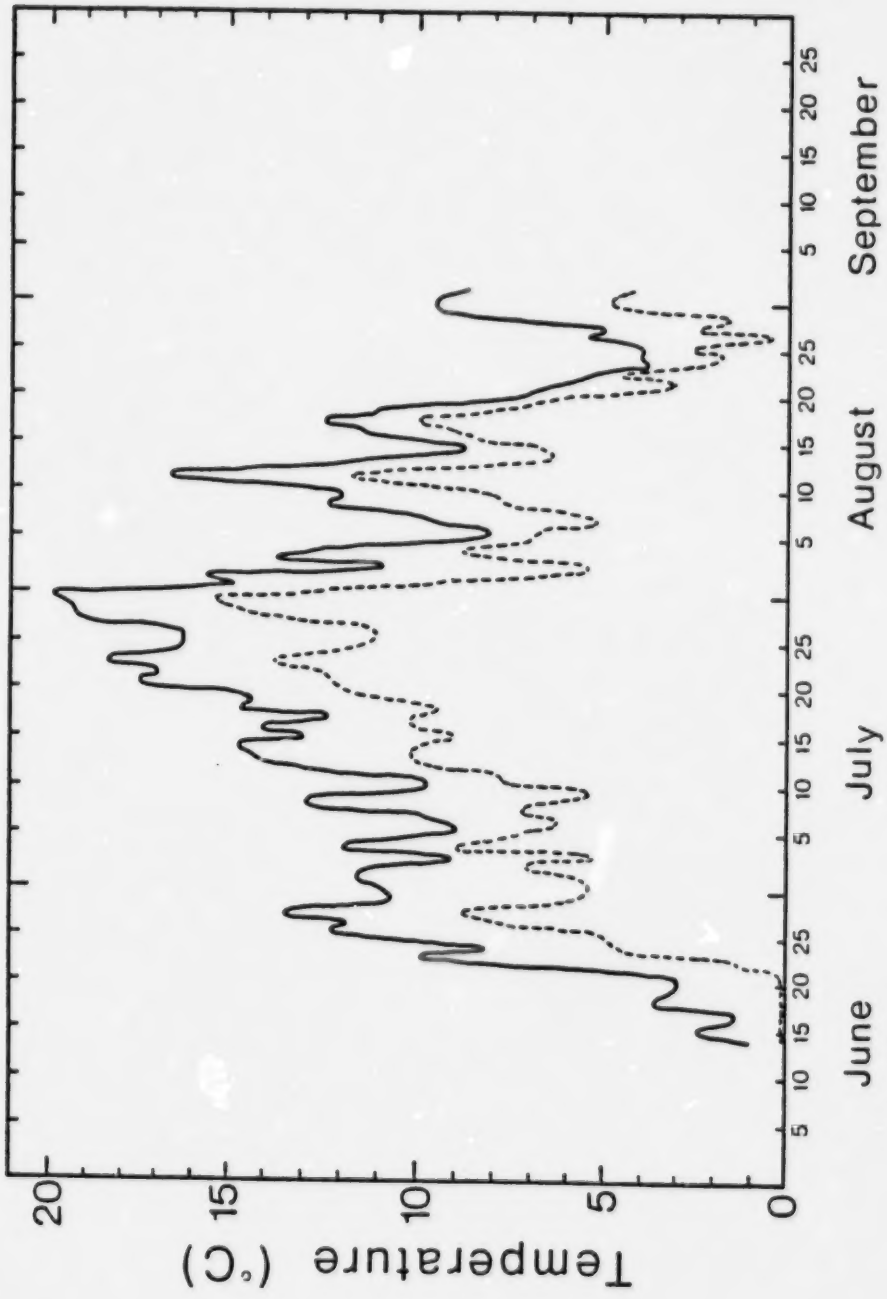

Figure 16. Maximum and minimum daily surface water temperatures for the Willow Creek, 1976. (———) Max. (- - - - -) Min.

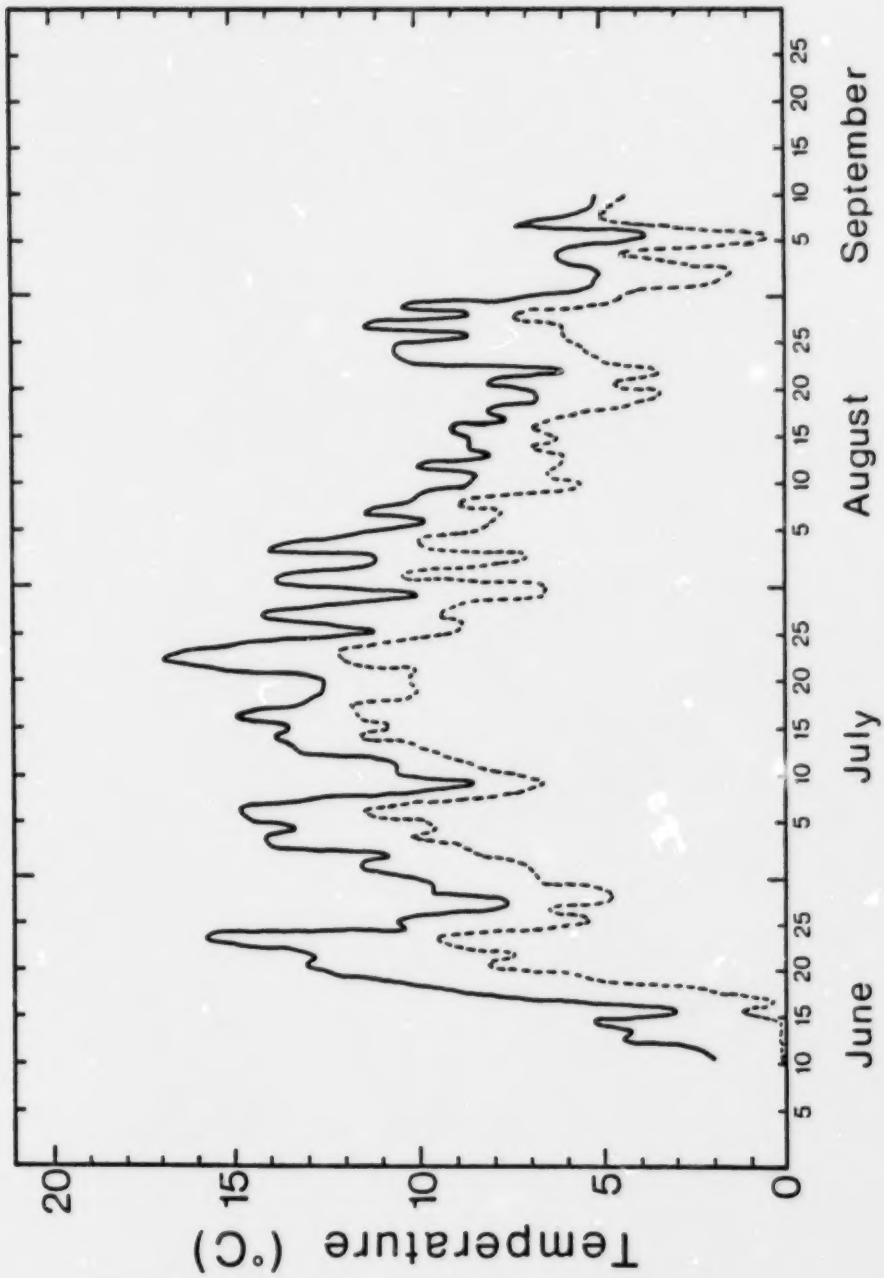

Figure 17. Maximum and minimum daily surface water temperatures for the Willow Creek, 1977. (———) Max. (- - - -) Min.

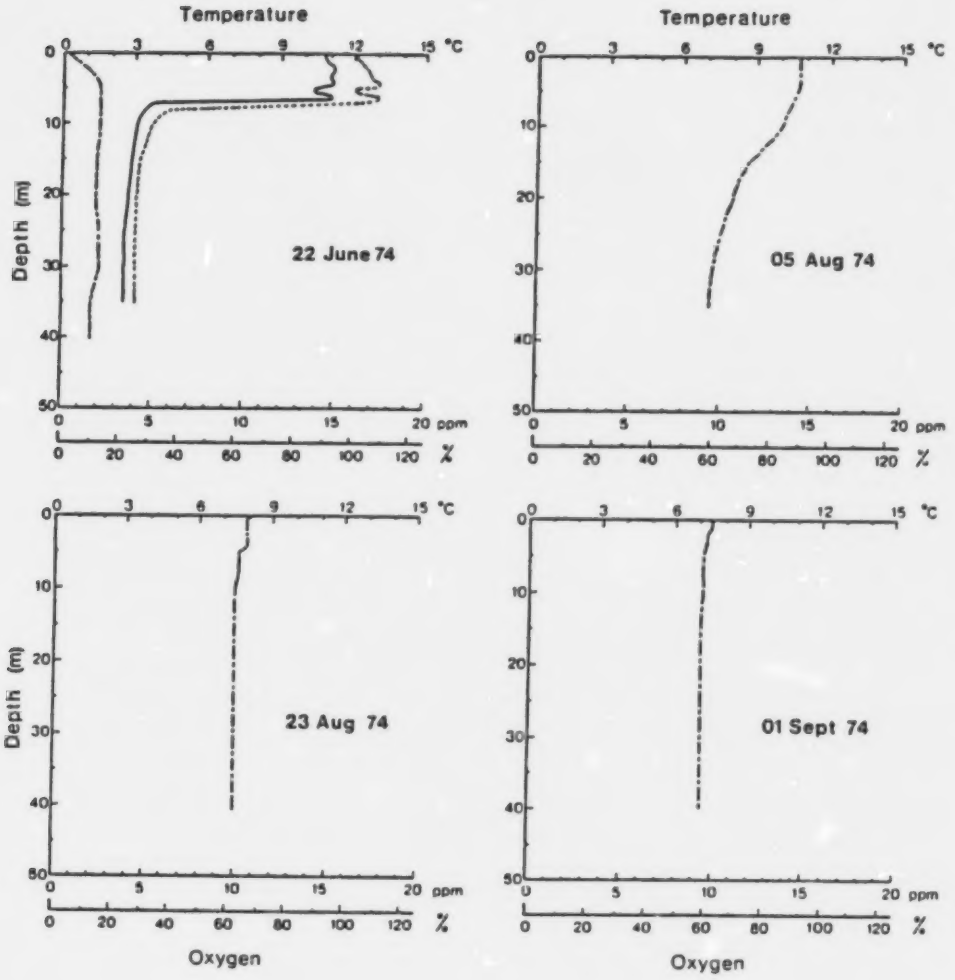

Figure 18. Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1974. (-·-·-·-) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

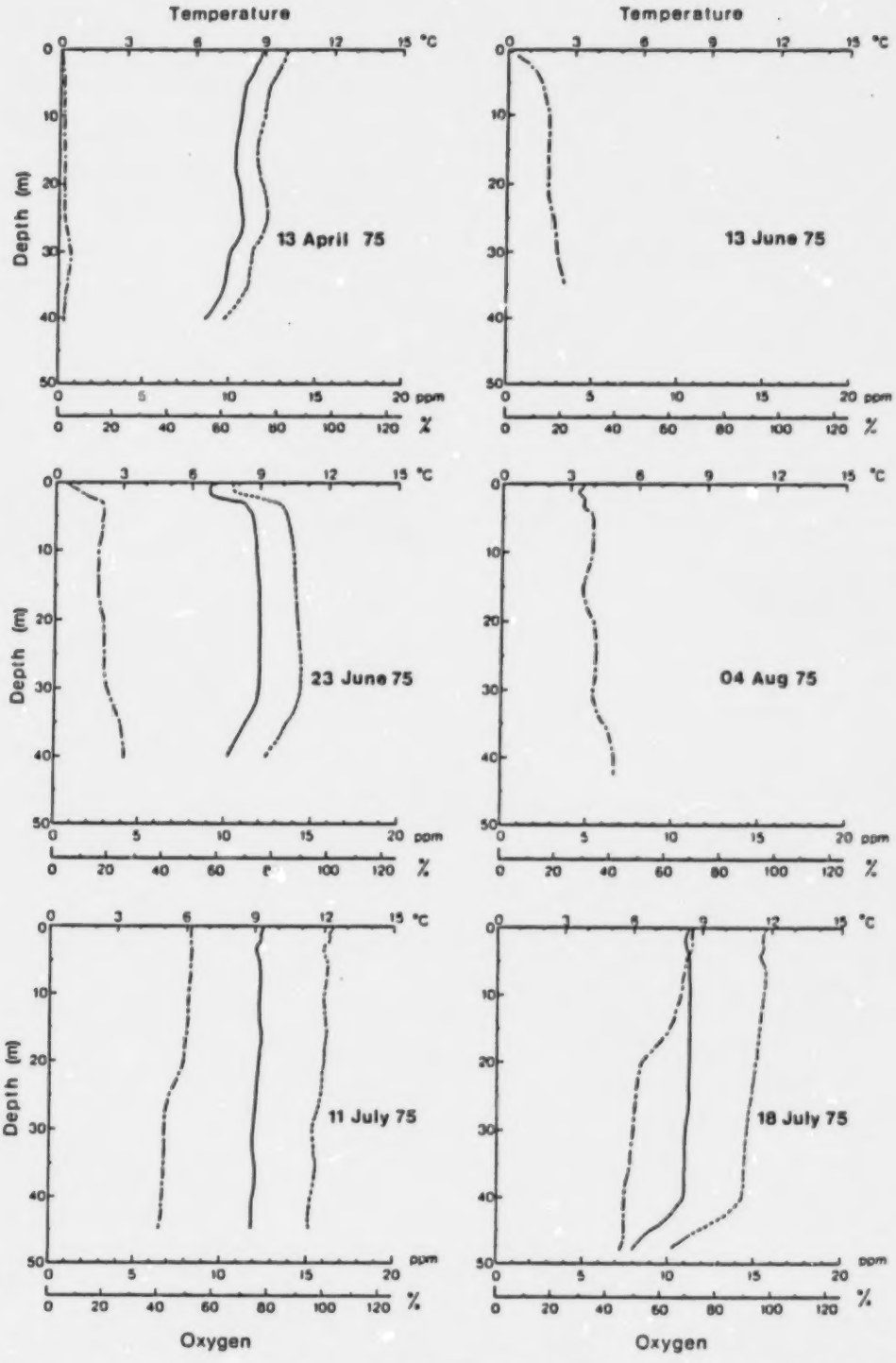

Figure 19. (Part 1) Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1975. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

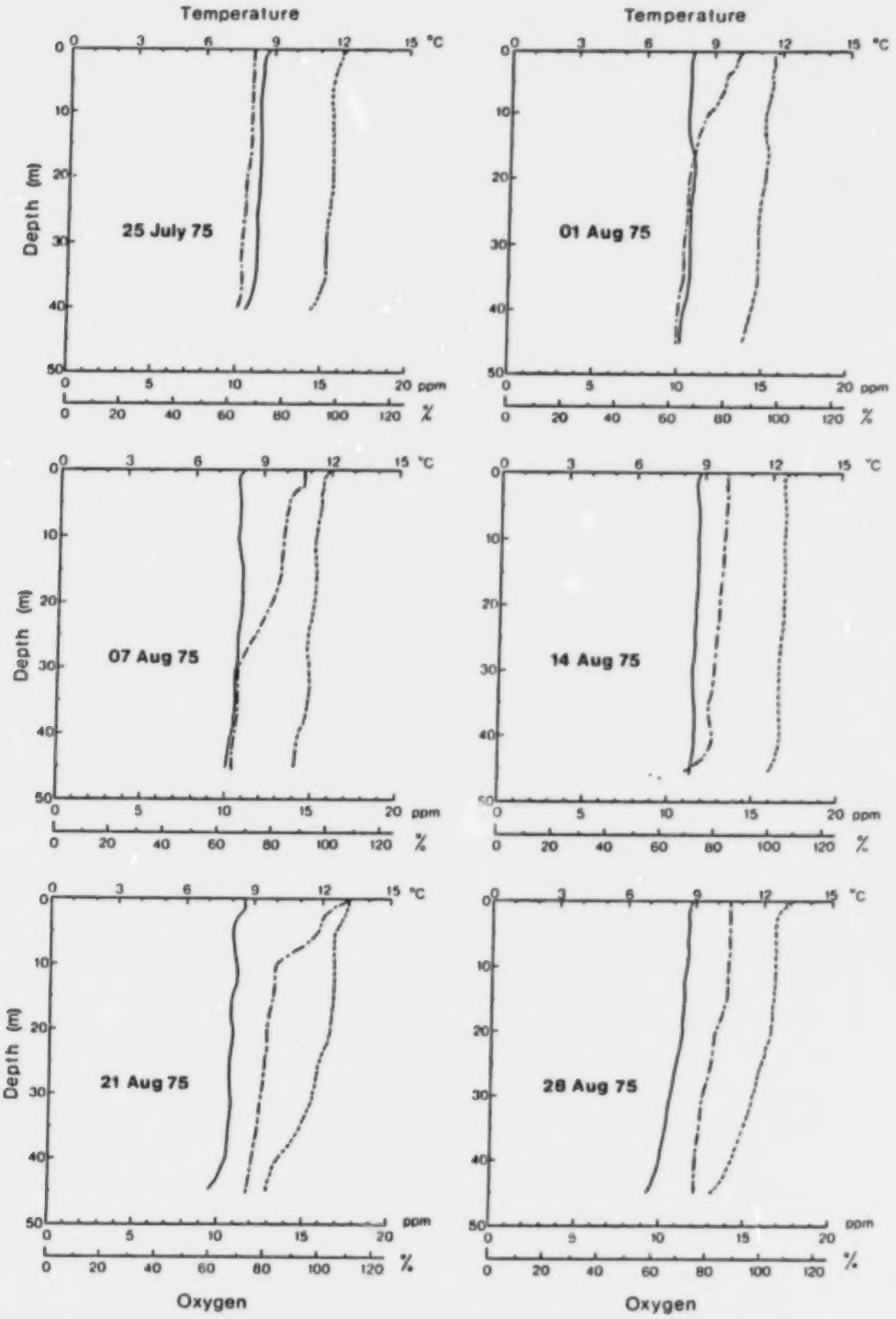

Figure 19. (Part 2) Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1975. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

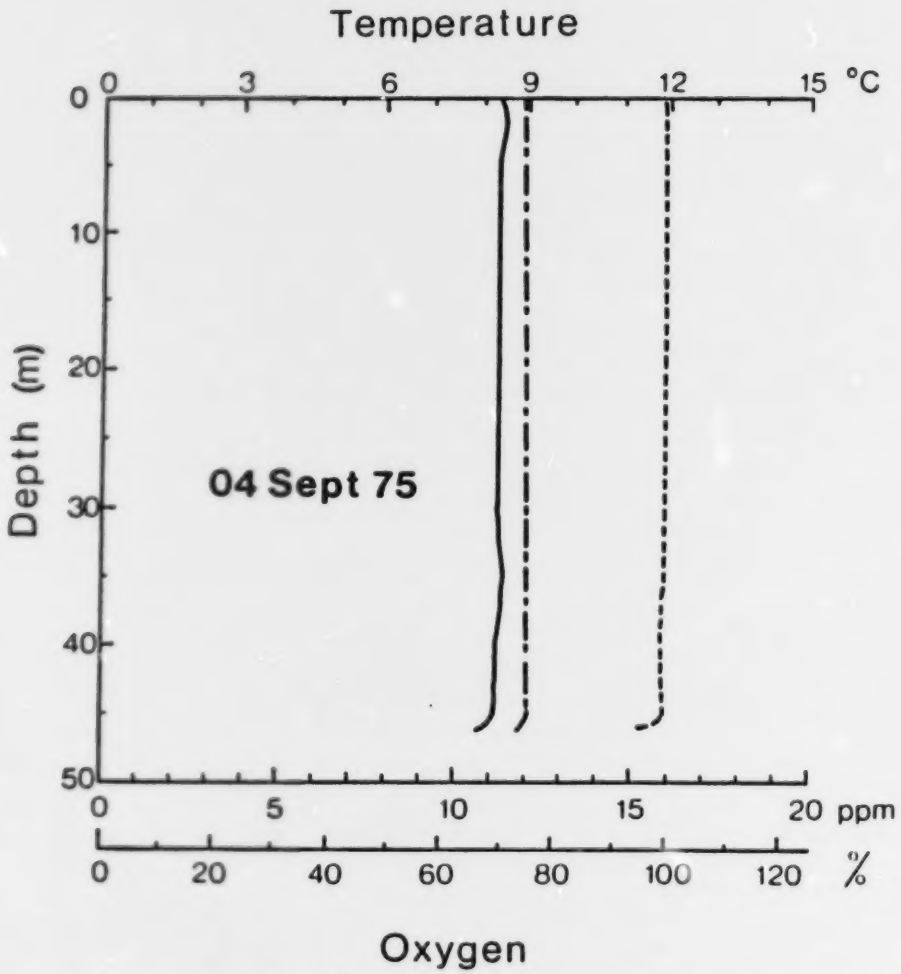

Figure 19. (Part 3) Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1975. (-·-·-·-) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

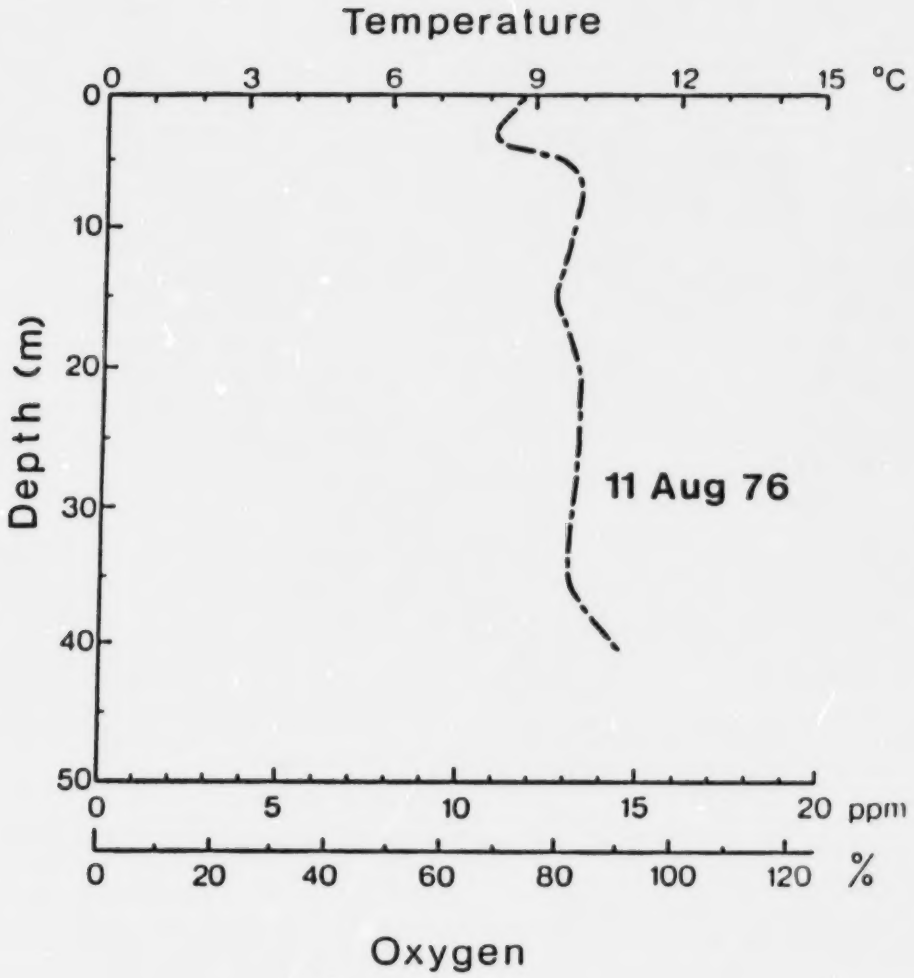

Figure 20. Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1976. (·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

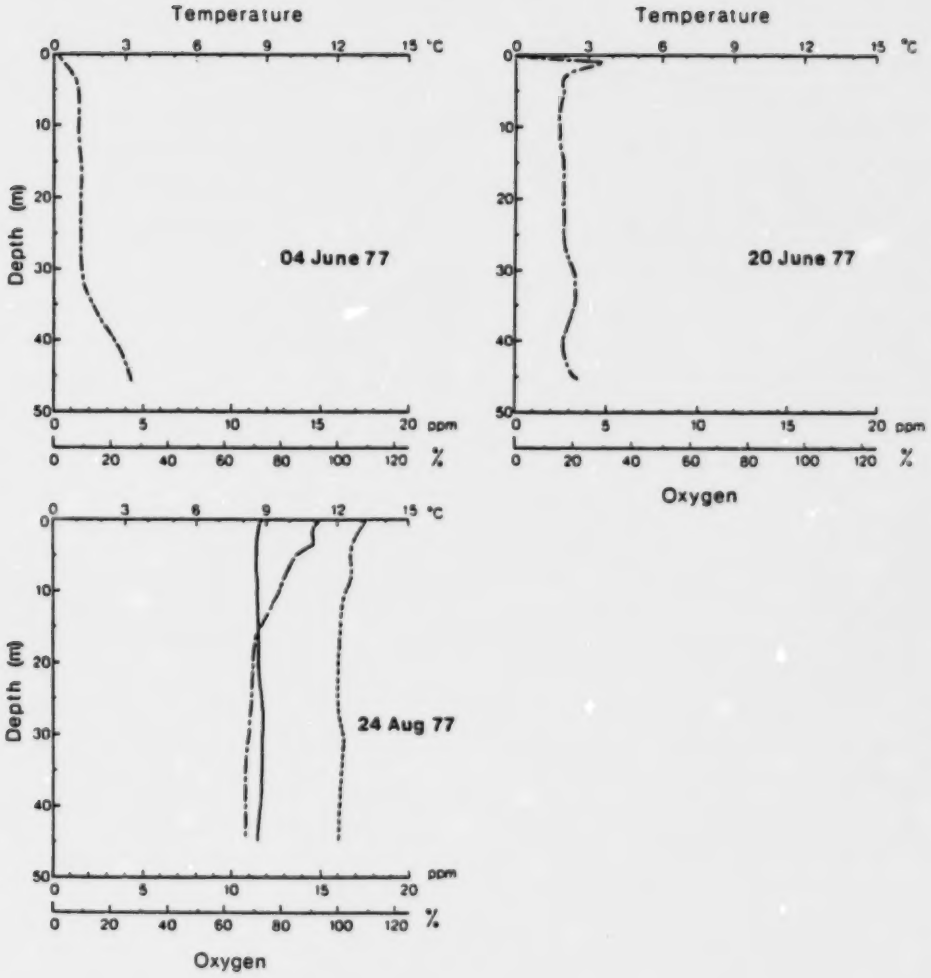

Figure 21. Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1977. (·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

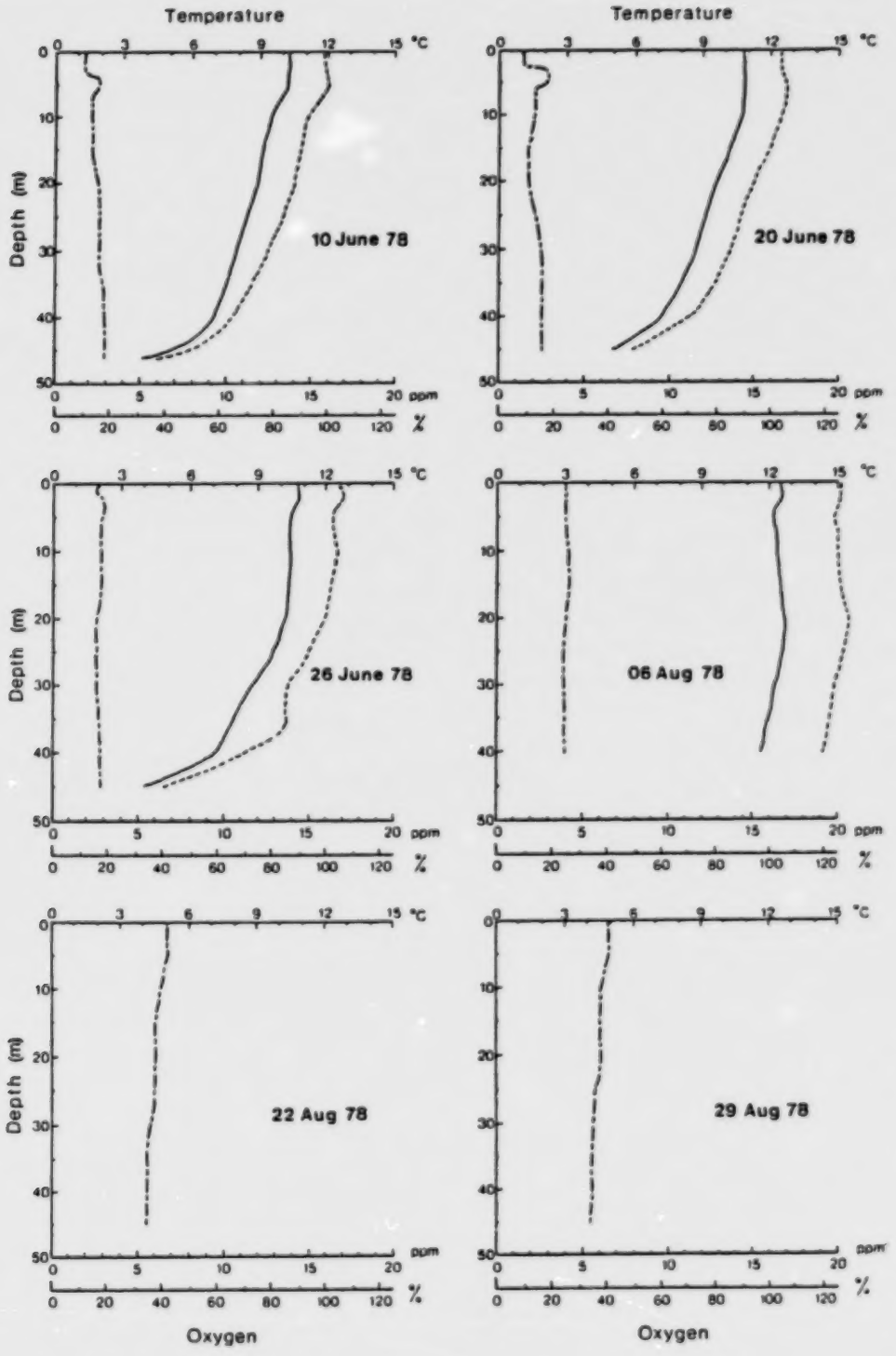

Figure 22. Temperature, oxygen and percent oxygen saturation profiles for Nauyuk Lake, Station #002, 1978. (·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

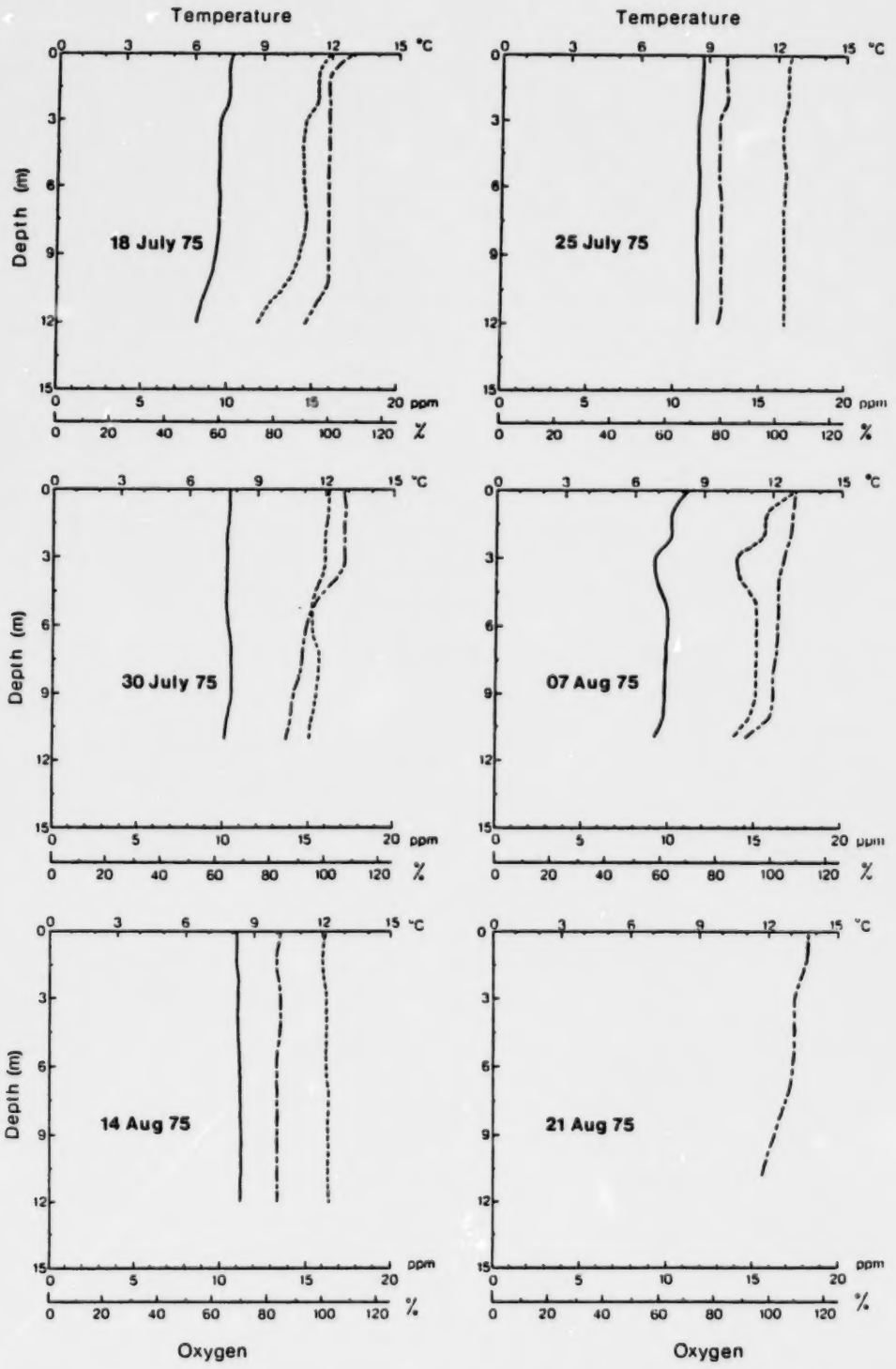

Figure 23. (Part 1) Temperature, oxygen and percent oxygen saturation profiles for Willow Lake, 1975. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

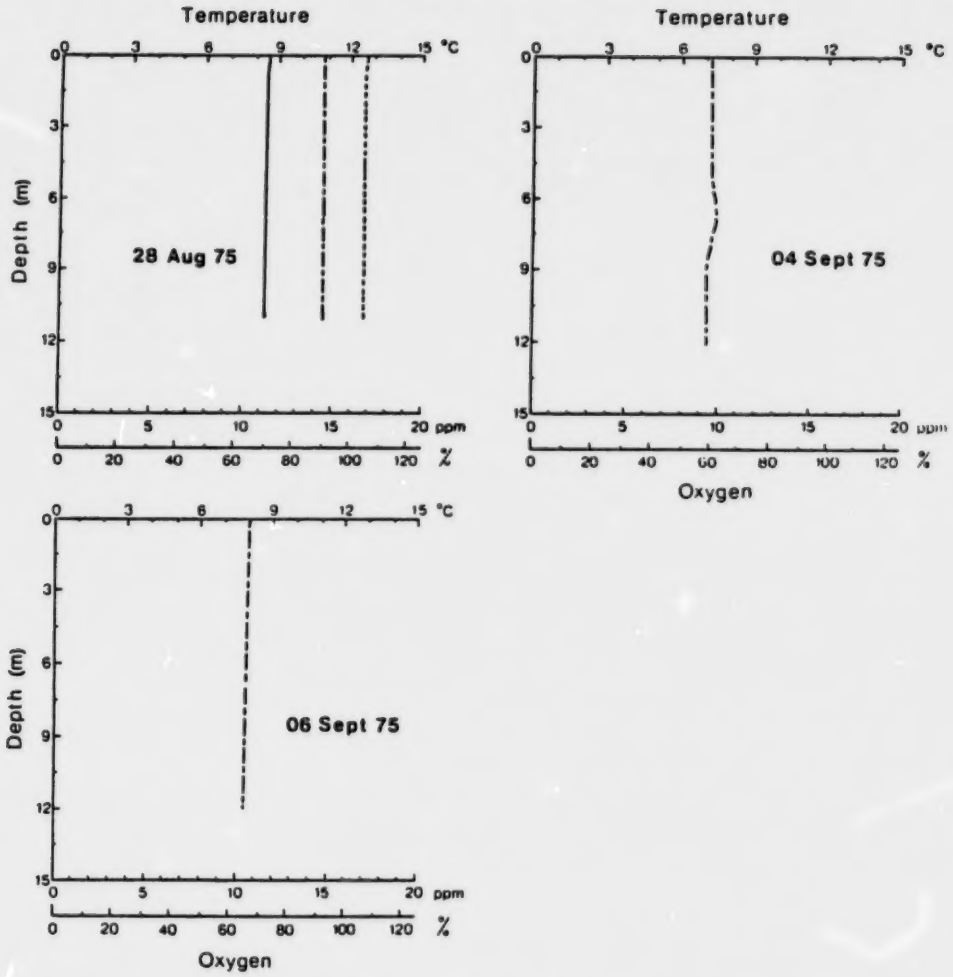

Figure 23. (Part 2) Temperature, oxygen and percent oxygen saturation profiles for Willow Lake, 1975. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

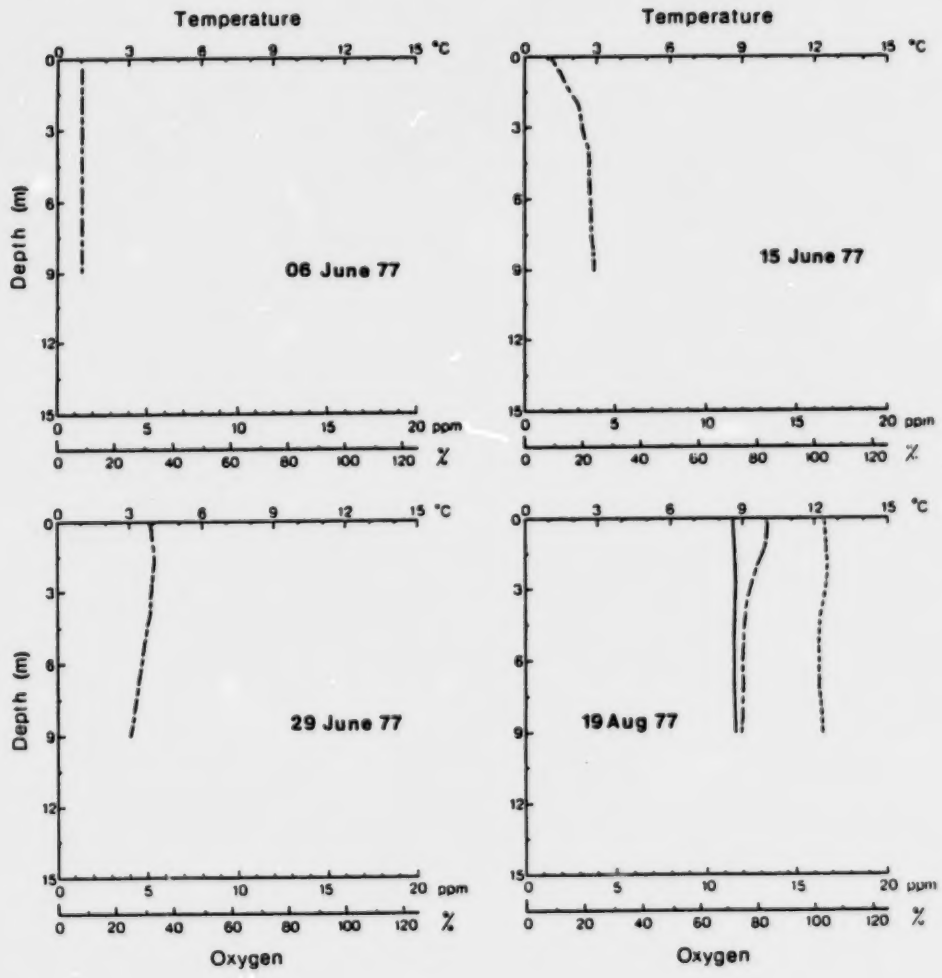

Figure 24. Temperature, oxygen and percent oxygen saturation profiles for Willow Lake, 1977. (·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

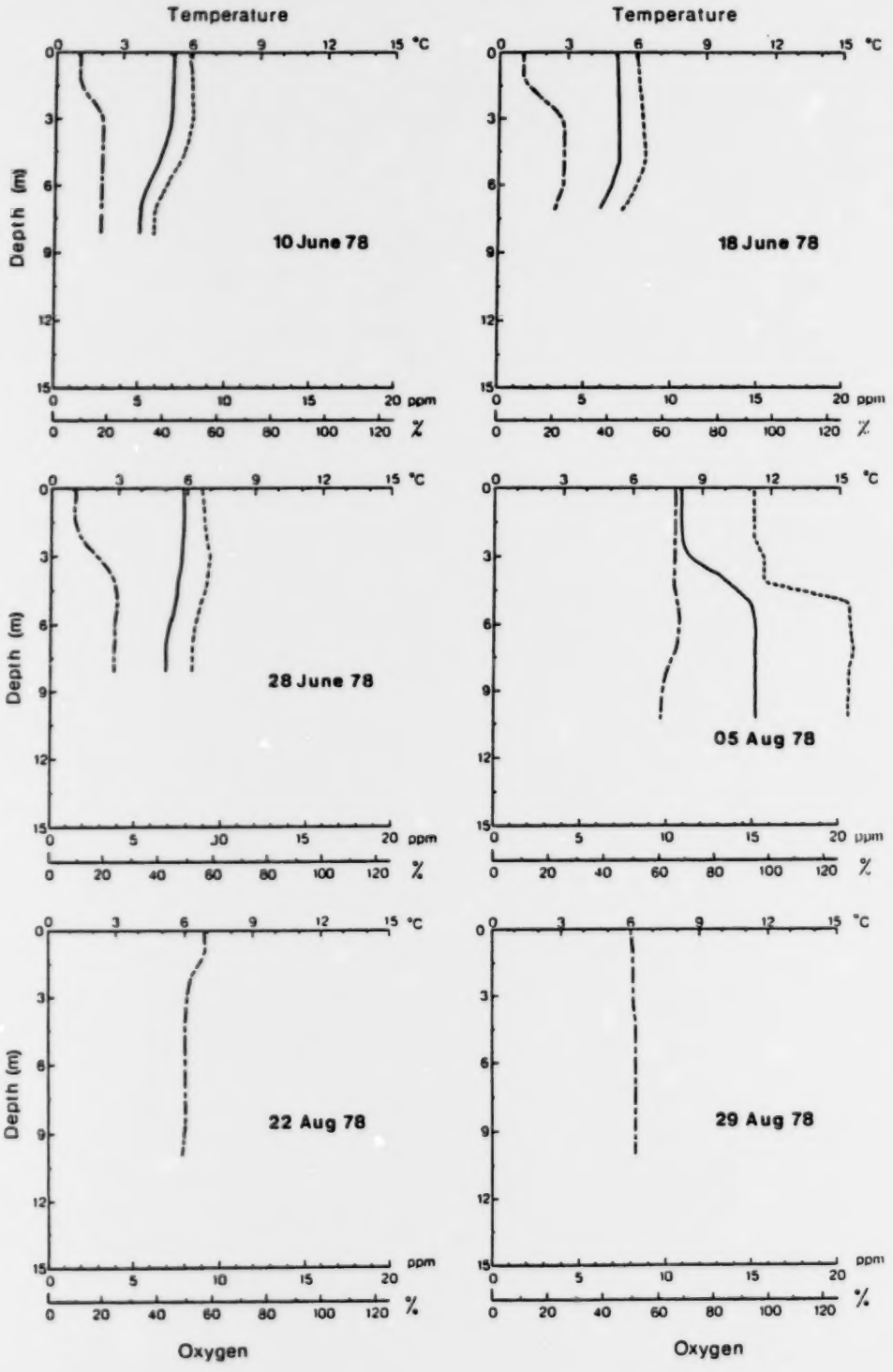

Figure 25. Temperature, oxygen and percent oxygen saturation profiles for Willow Lake, 1978. (-·-·-·-) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

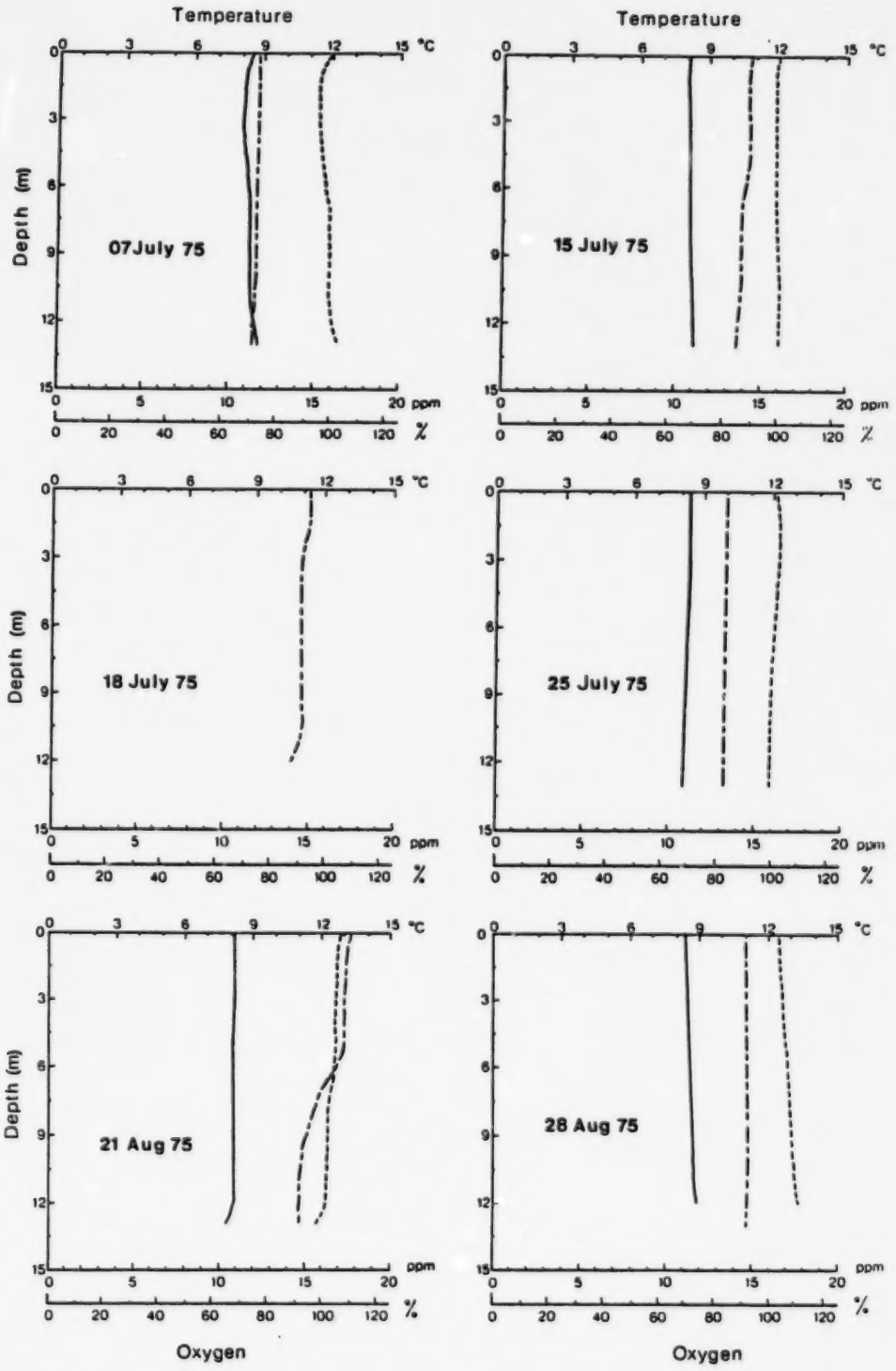

Figure 26. (Part 1) Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1975. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

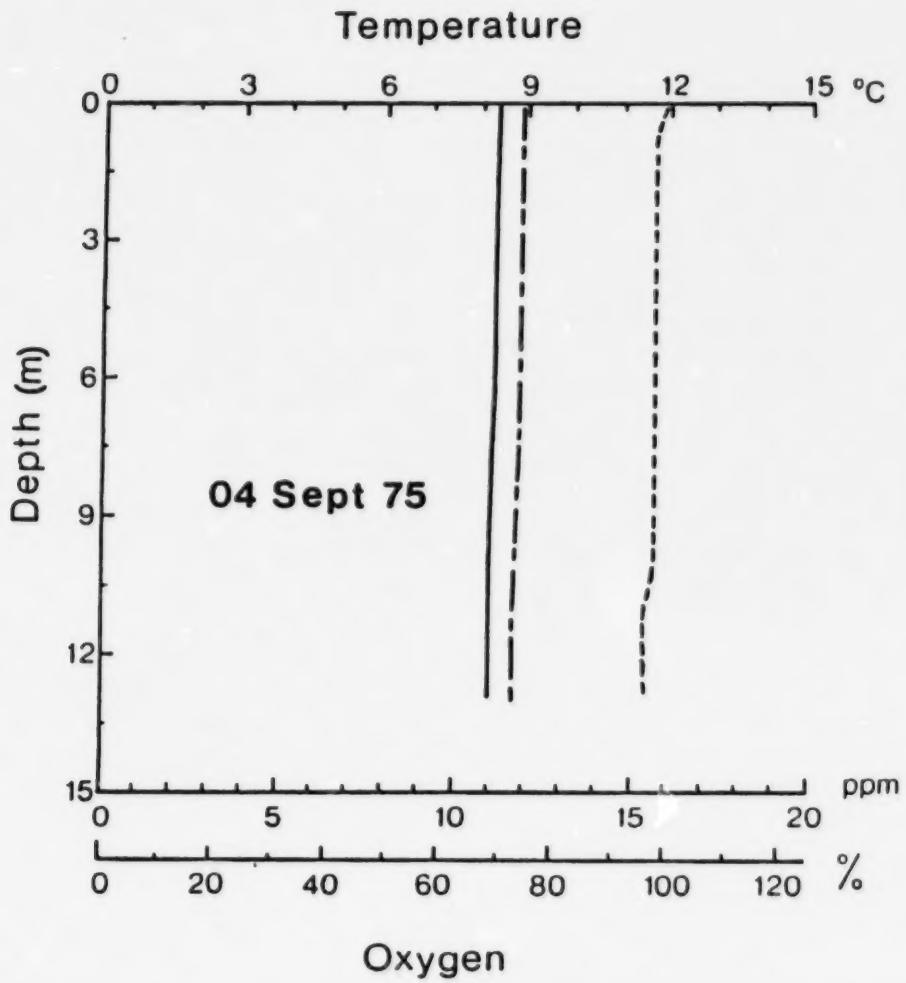

Figure 26. (Part 2) Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1975. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

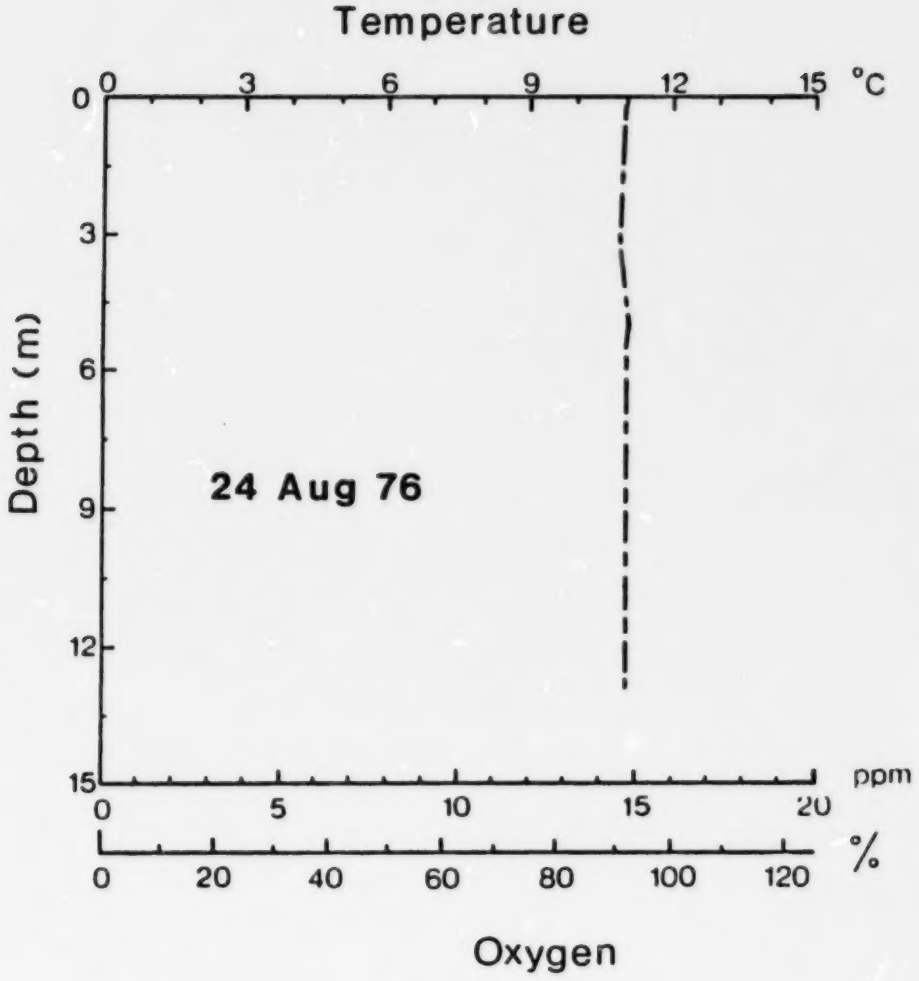

Figure 27. Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1976. (·–·–·–·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

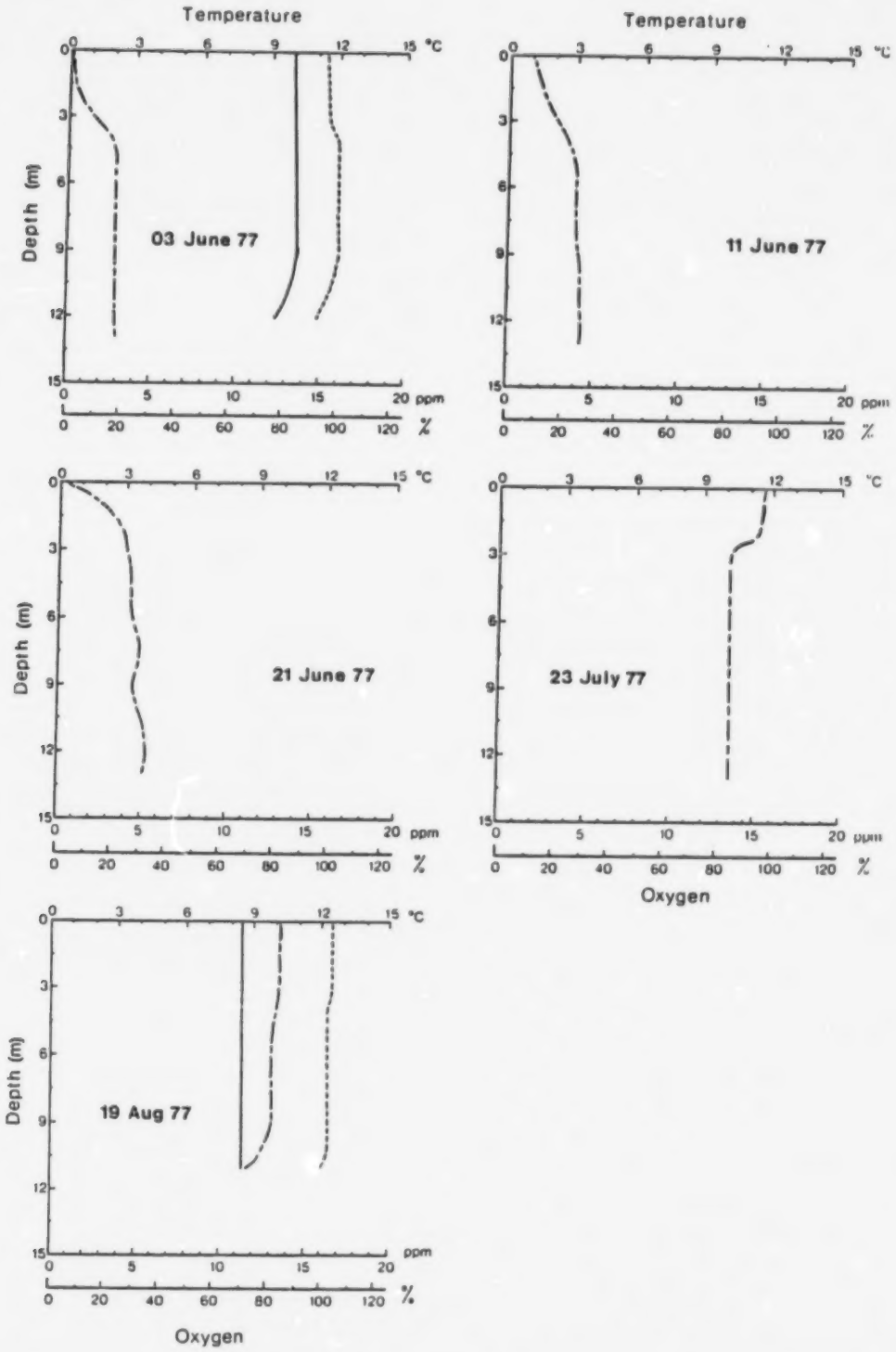

Figure 28. Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1977. (·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

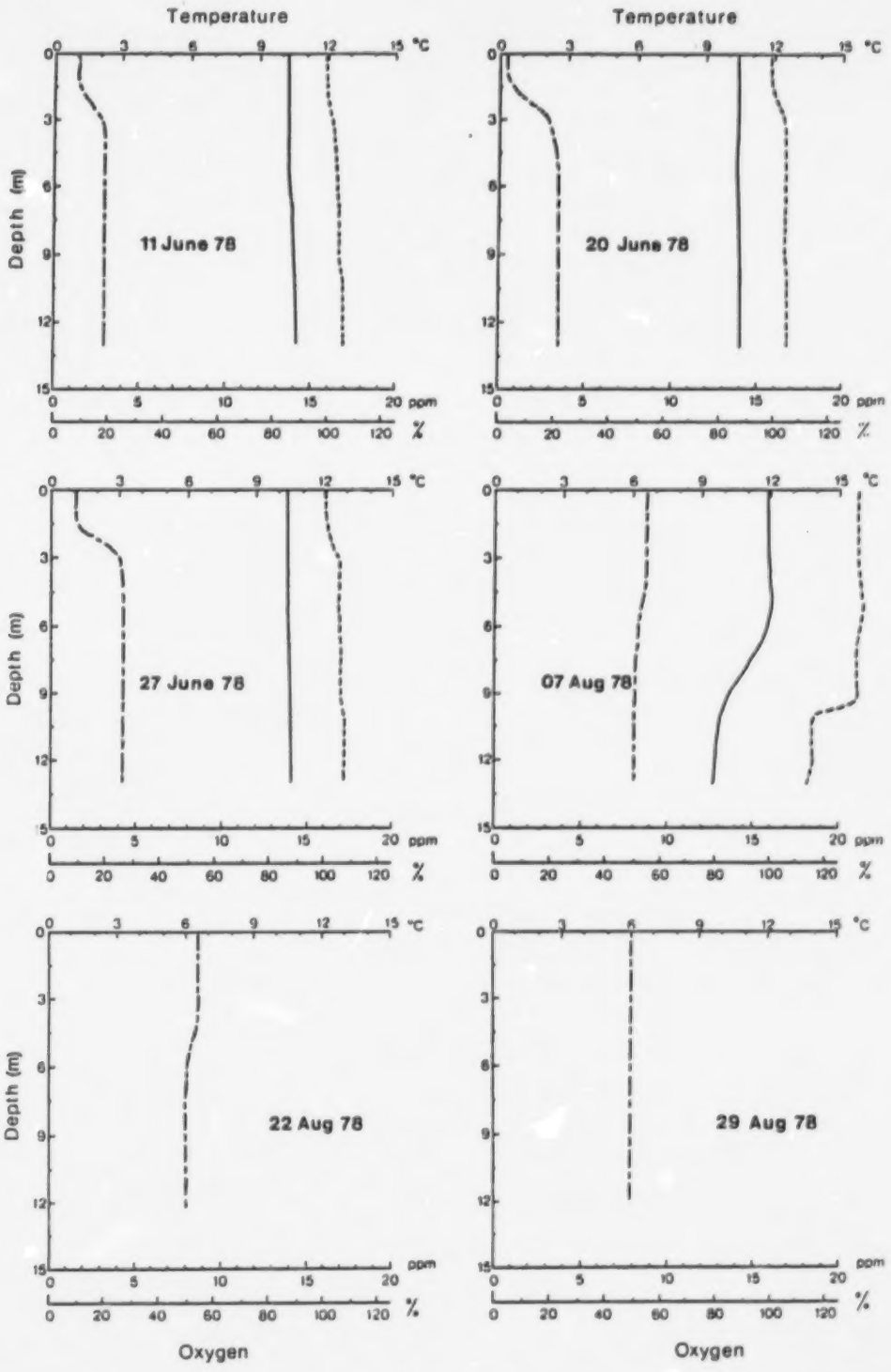

Figure 29. (Part 1) Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1978. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

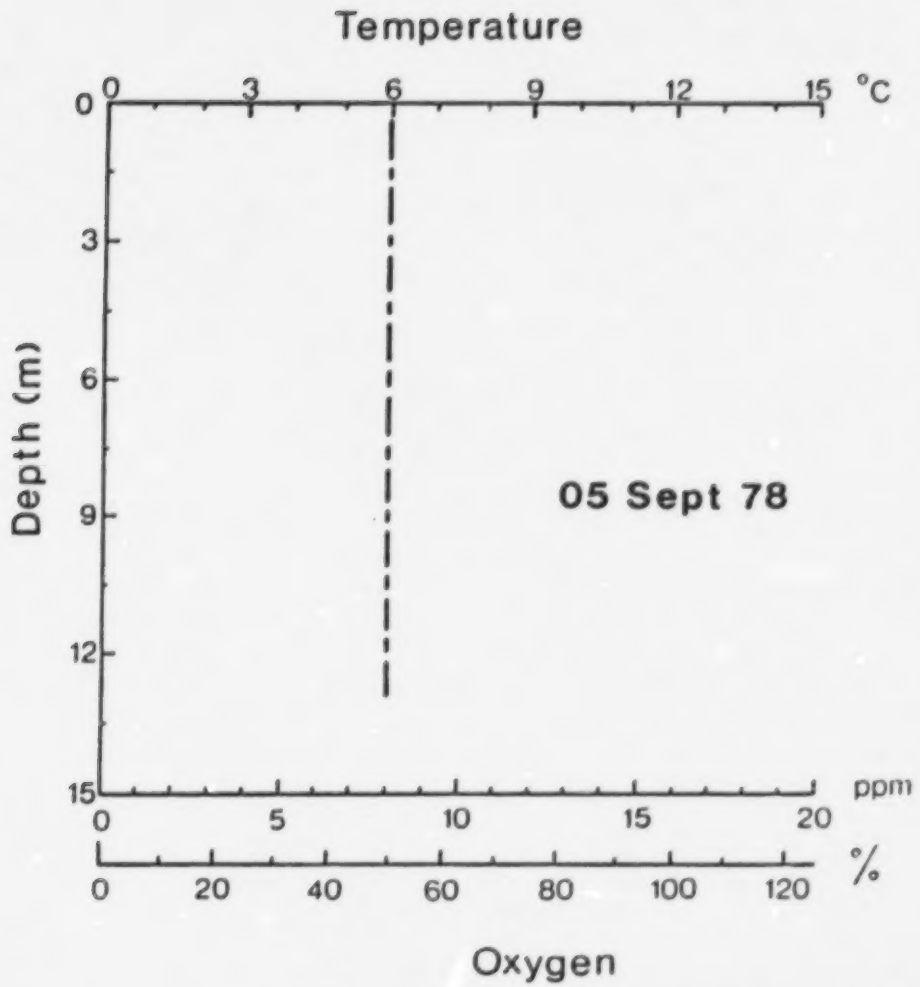

Figure 29. (Part 2) Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1978. (·-·-·-·) temperature, (————) O_2 ppm and (-------) $\%O_2$ saturation.

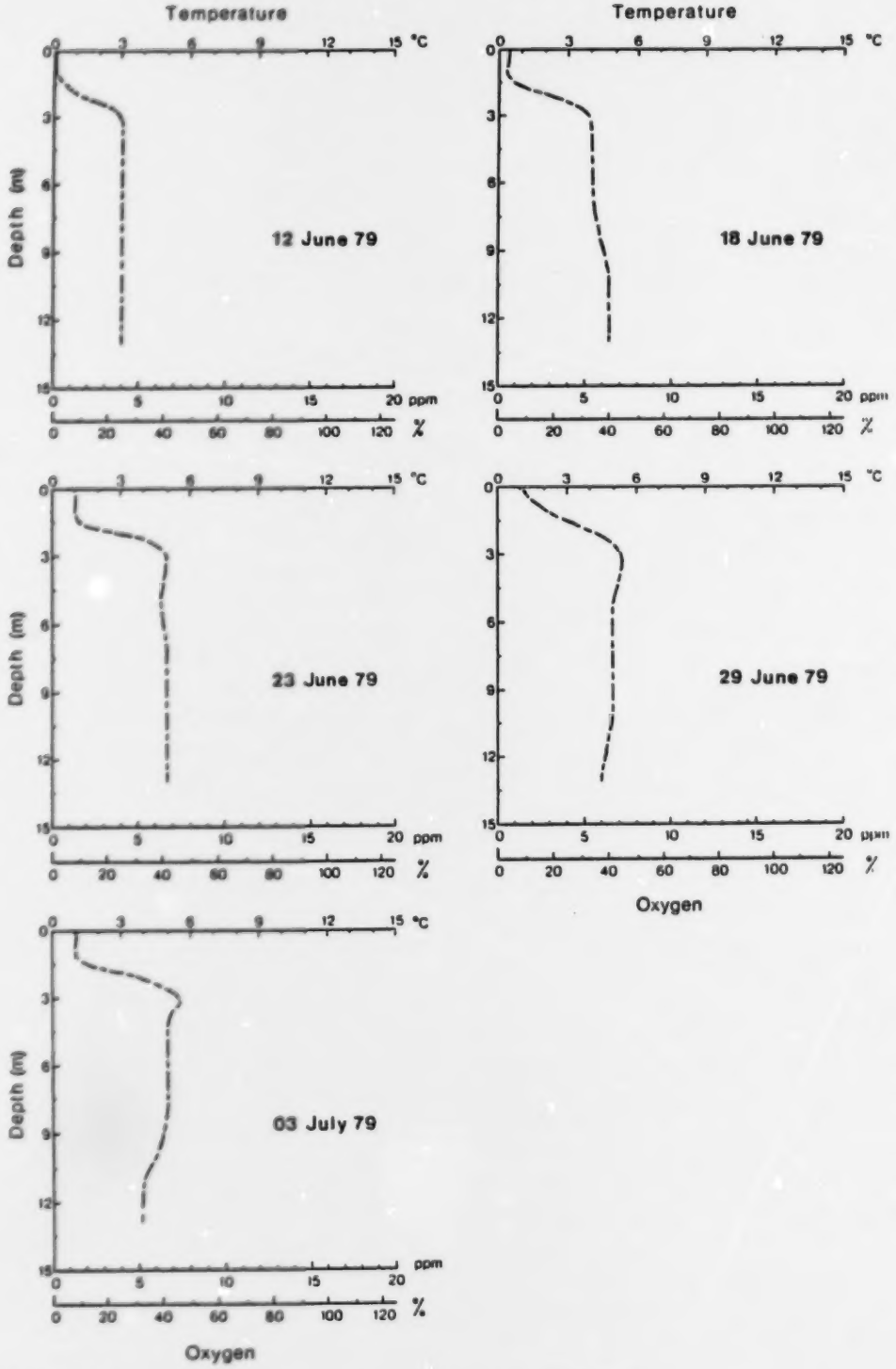

Figure 30. Temperature, oxygen and percent oxygen saturation profiles for Little Nauyuk Lake, 1979. (·-·-·-·) temperature, (———) O_2 ppm and (– – – – –) $\%O_2$ saturation.

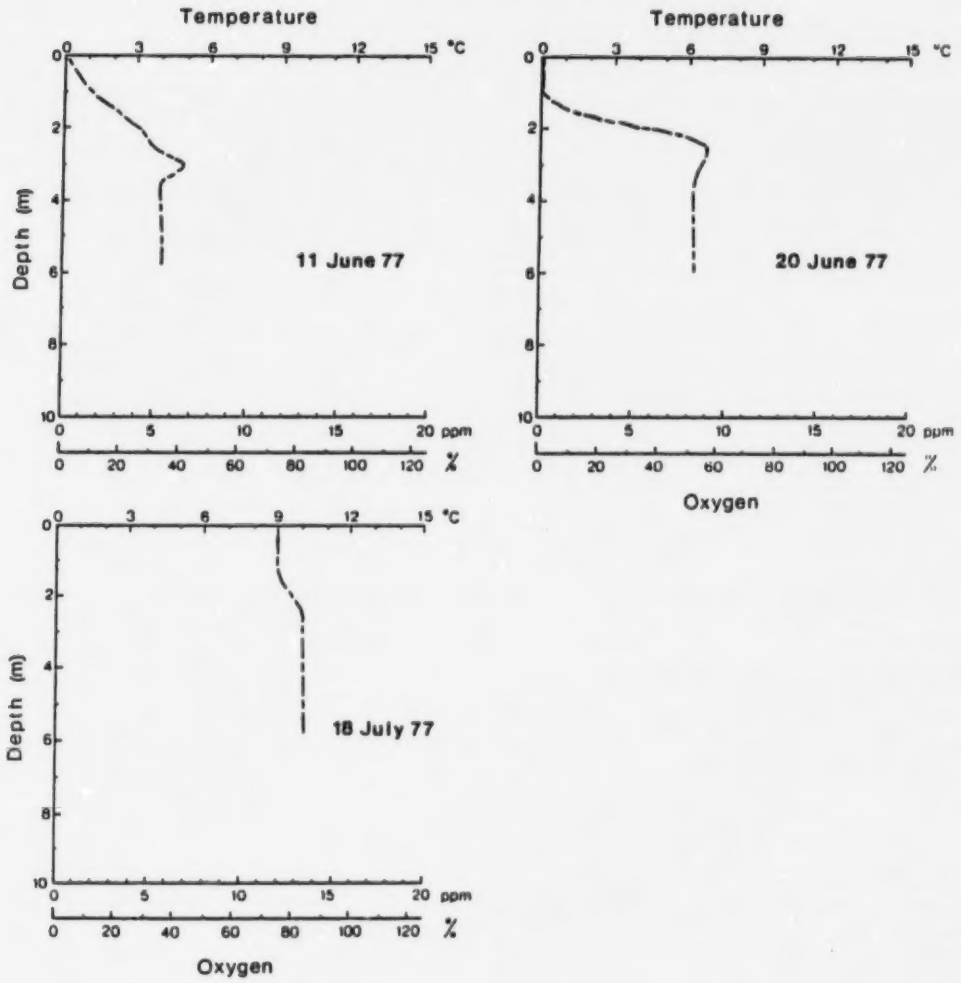

Figure 31. Temperature, oxygen and percent oxygen saturation profiles for Gavia Lake, 1977. (-·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

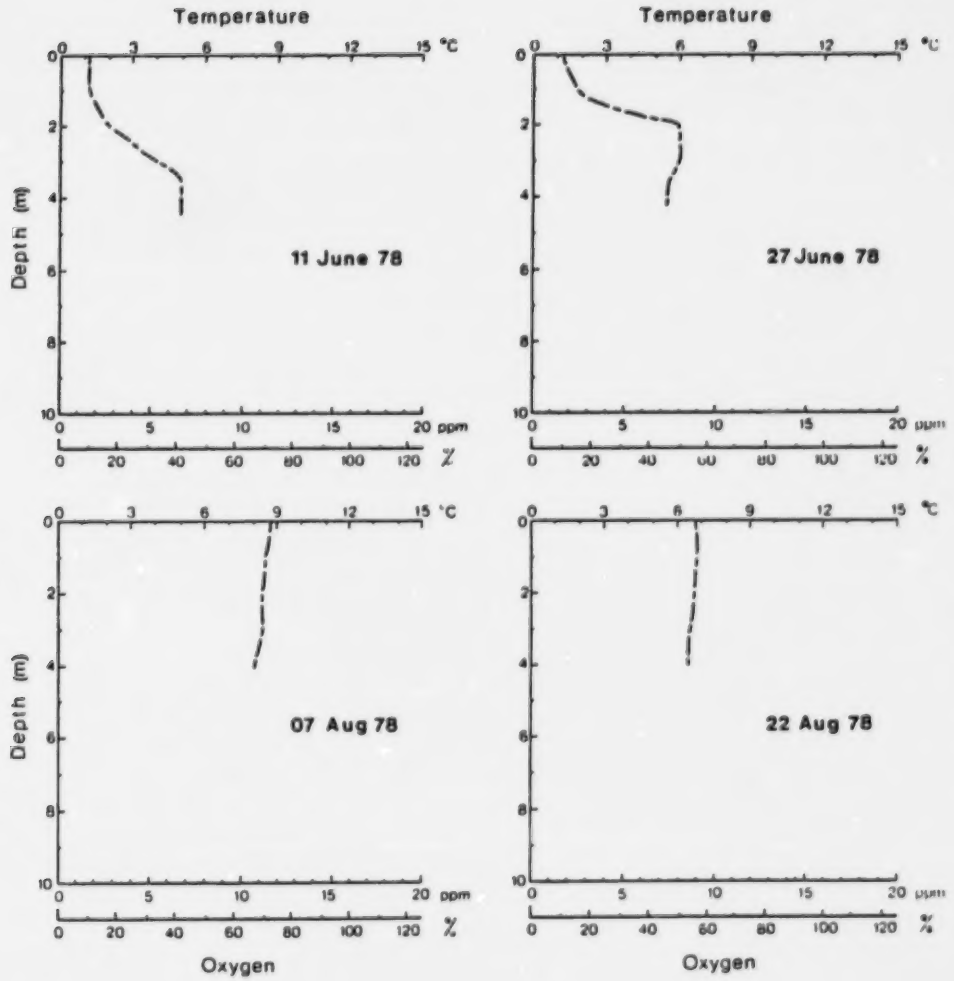

Figure 32. Temperature, oxygen and percent oxygen saturation profiles for Gavia Lake, 1978. (·-·-·-·) temperature, (———) O_2 ppm and (------) $\%O_2$ saturation.

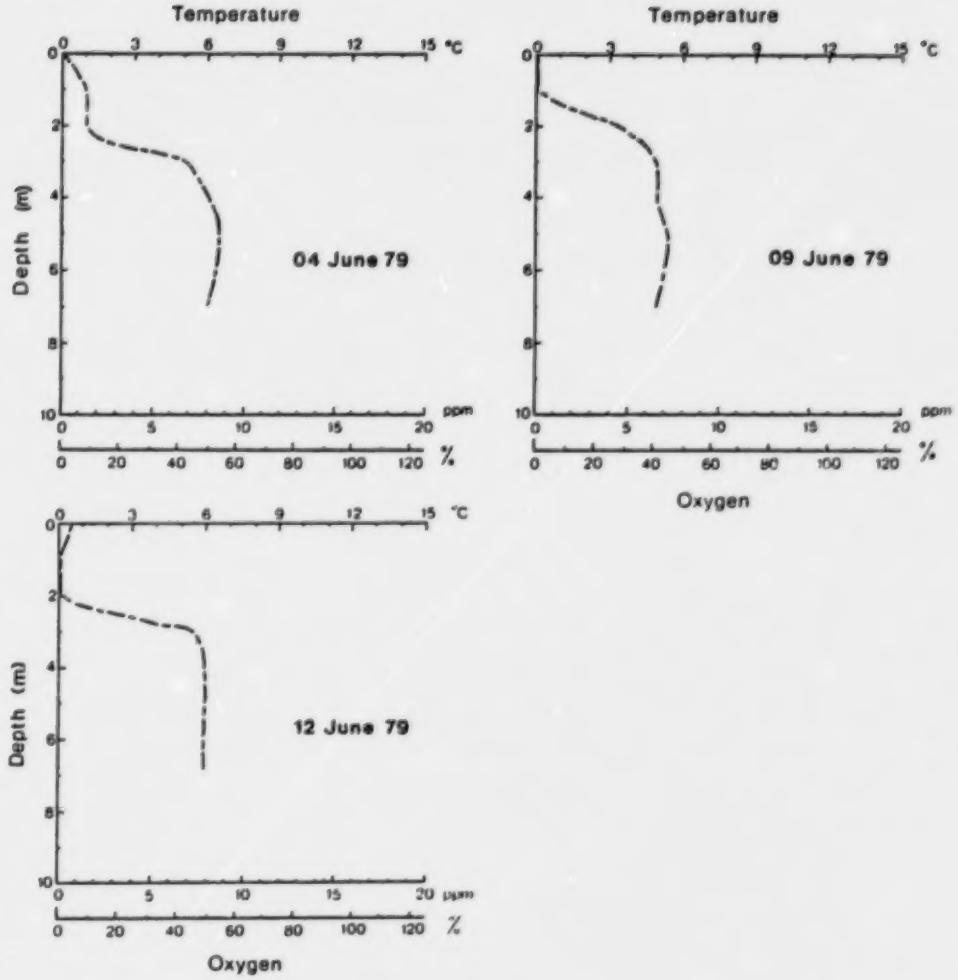

Figure 33. Temperature, oxygen and percent oxygen saturation profiles for Gavia Lake, 1979. (·-·-·-·) temperature, (———) O_2 ppm and (– – – – –) $\%O_2$ saturation.

Table 1. Morphometric data from the study lakes.

	NAUYUK	WILLOW	LITTLE NAUYUK	GAVIA	NOTGORDIE
Maximum Length (m $x10^2$)	70.5	41.3	21.1	6.2	6.6
Maximum Width (m $x10^2$)	58.2	11.5	4.2	5.2	1.8
Maximum Depth (m)	52.0	12.0	15.0	8.0	6.0
Mean Depth (m)	5.7	-	7.1	2.9	2.4
Area (ha)	2485.9	180.2	44.6	17.4	7.1
Volume (m^3 $x10^5$)	1412.1	-	31.7	5.1	1.7
Area (> than 2m)(ha)	-	-	38.2	10.0	4.4
Mean Depth (> than 2m)(m)			7.6	4.3	3.5
Normal Ice Thickness (m)			2.0	2.0	2.0
Minimum Winter Volume (m^3 $x10^5$)			21.4	2.3	0.7

Table 2. Mean daily water levels (cm above datum) for Nauyuk Lake, 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	56.5	31.0	20.9E
2	-	55.5	30.5	20.6E
3	-	54.0	30.0	20.4E
4	-	52.0	30.0	20.1E
5	-	51.0	29.5	19.8E
6	-	50.5	29.0	19.5
7	-	49.0	28.5	-
8	-	47.5	28.0	-
9	-	47.0	27.5	-
10	37.0	46.5	27.5	-
11	40.0	46.0	27.0	-
12	45.0	44.5	26.5	-
13	52.0	43.8E	26.0	-
14	59.0	43.2E	25.5	-
15	65.0	42.5	25.0	-
16	70.0	41.5	24.5	-
17	73.0	40.0	24.0	-
18	72.5	40.0	23.5	-
19	71.5	39.5	23.5E	-
20	71.5	39.0	23.5	-
21	70.0	38.0	23.0	-
22	68.5	37.5	22.5	-
23	67.3E	36.5	22.0	-
24	66.0	36.0E	21.5	-
25	65.0	35.5	21.0	-
26	63.5	34.5	21.0	-
27	62.5	34.0	21.0	-
28	61.0	33.5	20.5	-
29	59.5	33.0	21.5	-
30	58.0	32.0	21.5	-
31		31.5	21.2E	
MEAN	61.8	42.3	25.1	20.2

E = ESTIMATED

Table 3. Mean daily water levels (cm above datum) for Nauyuk Lake, 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	43.0	38.5	26.3E
2	-	48.0	37.0	26.0
3	-	51.0	36.5	25.5
4	-	52.5	36.0	25.0E
5	-	53.5	35.5	24.5
6	-	53.5	35.5	24.3E
7	-	52.5	35.5	24.0E
8	-	53.0	35.0	23.7E
9	-	52.5	34.5	23.5E
10	-	52.0	33.5	23.3E
11	-	50.5	33.5	23.0
12	-	50.0	32.0	23.3E
13	-	50.0	32.0	22.5
14	-	49.0	31.5	22.0E
15	-	48.5	31.0	21.5E
16	-	47.5	31.0	21.0
17	-	46.5	31.0	-
18	-	45.5	30.5	-
19	-	45.0	30.5	-
20	-	45.0	30.0E	-
21	-	44.5	29.5	-
22	-	43.0	29.2	-
23	-	42.5	29.2	-
24	-	42.0	30.0	-
25	-	41.5	29.0	-
26	-	41.0	27.5	-
27	-	40.5	28.5	-
28	-	39.8E	27.5	-
29	28.5	39.0	27.2E	-
30	35.0	38.5	26.8E	-
31		38.5	26.5	-
MEAN	-	46.4	31.7	23.7

E = Estimated

Table 4. Mean daily discharge rates ($m^3 \cdot s^{-1}$) for the Nauyuk River, 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	3.66	1.21	0.61E
2	-	3.55	1.18	0.60E
3	-	3.39	1.15	0.59E
4	-	3.18	1.15	0.57E
5	-	3.06	1.12	0.56E
6	-	3.01	1.09	0.55
7	-	2.84	1.06	-
8	-	2.71	1.02	-
9	-	2.68	0.99	-
10	1.63	2.60	0.99	-
11	1.92	2.56	0.96	-
12	2.46	2.39	0.93	-
13	3.18	2.33E	0.89	-
14	3.95	2.26E	0.86	-
15	4.80	2.20	0.84	-
16	5.47	2.10	0.80	-
17	5.98	1.92	0.78	-
18	5.90	1.92	0.74	-
19	5.73	1.85	0.74E	-
20	5.73	1.81	0.74	-
21	5.47	1.71	0.72	-
22	5.30	1.68	0.69	-
23	5.11E	1.59	0.68	-
24	4.91	1.55E	0.64	-
25	4.80	1.51	0.62	-
26	4.60	1.43	0.62	-
27	4.37	1.41	0.62	-
28	4.24	1.38	0.60	-
29	4.02	1.33	0.64	-
30	3.85	1.27	0.64	-
31		1.24	0.63E	-
TOTAL (dam^3)	8071.49	5885.57	2276.64	300.67
MEAN	4.45	2.20	0.85	0.58

E = Estimated

Table 5. Mean daily discharge rates ($m^3 \cdot s^{-1}$) for the Nauyuk River, 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	2.26	1.76	0.91E
2	-	2.76	1.63	0.89
3	-	3.06	1.59	0.86
4	-	3.24	1.38	0.83E
5	-	3.35	1.51	0.80
6	-	3.35	1.51	0.79E
7	-	3.24	1.51	0.77E
8	-	3.30	1.47	0.76E
9	-	3.24	1.43	0.75E
10	-	3.18	1.38	0.73E
11	-	3.01	1.38	0.72
12	-	2.94	1.27	0.71E
13	-	2.94	1.27	0.69
14	-	2.84	1.24	0.67E
15	-	2.79	1.21	0.64E
16	-	2.71	1.21	0.62
17	-	2.60	1.21	-
18	-	2.51	1.18	-
19	-	2.46	1.18	-
20	-	2.46	1.15E	-
21	-	2.39	1.12	-
22	-	2.24	1.11	-
23	-	2.20	1.11	-
24	-	2.13	1.15	-
25	-	2.10	1.09	-
26	-	2.03	0.99	-
27	-	1.97	1.06	-
28	-	1.89E	0.99	-
29	1.06	1.82	0.97E	-
30	1.47	1.76	0.95E	-
31		1.76	0.93	
TOTAL (dam^3)	218.6	6954.34	3361.82	1048.90
MEAN	-	2.60	1.25	0.76

E = Estimated

Table 6. Mean daily discharge rates ($m^3 \cdot s^{-1}$) for the Nauyuk River, 1979.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	2.93	1.51	-
2	-	2.93	1.51	-
3	-	2.86	1.49	-
4	-	2.80	1.45	-
5	-	2.80	1.47	-
6	-	2.71	1.47	-
7	-	2.76	1.45	-
8	-	2.66	1.38	-
9	-	2.66	-	-
10	-	2.54	-	-
11	-	2.44	-	-
12	-	2.47	-	-
13	-	2.47	-	-
14	-	2.40	-	-
15	-	2.34	-	-
16	-	2.34	-	-
17	-	2.29	-	-
18	-	2.26	-	-
19	-	2.17	-	-
20	-	2.15	-	-
21	-	2.08	-	-
22	-	2.00	-	-
23	3.00	1.97	-	-
24	3.06	1.87	-	-
25	3.13	1.87	-	-
26	3.17	1.78	-	-
27	3.16	1.74	-	-
28	3.09	1.69	-	-
29	3.00	1.64	-	-
30	3.00	1.58	-	-
31		1.54	-	
TOTAL (dam^3)	2126.30	6111.94	1013.47	
MEAN	3.08	2.28	1.47	

Table 7. Daily maximum and minimum water temperatures (°C), Nauyuk River, 1974.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	-	-	-	-	8.0	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-
5	-	-	5.3	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	4.8	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	-	-	6.0	-	-	-	-	-
10	-	-	-	-	-	-	-	-
11	-	-	-	-	9.8	-	-	-
12	-	-	-	-	8.0	-	-	-
13	-	-	8.5	-	8.0	-	-	-
14	-	-	-	-	6.5	-	-	-
15	-	-	7.5	-	6.0	-	-	-
16	-	-	-	-	6.5	-	-	-
17	-	-	-	-	6.0	-	-	-
18	-	-	-	-	9.0	-	-	-
19	-	-	10.0	-	-	-	-	-
20	-	-	-	-	8.0	-	-	-
21	5.0	-	-	-	9.5	-	-	-
22	-	-	-	-	8.0	-	-	-
23	-	-	-	-	-	-	-	-
24	-	-	-	-	8.0	-	-	-
25	-	-	-	-	7.5	-	-	-
26	-	-	-	-	7.5	-	-	-
27	-	-	-	-	7.5	-	-	-
28	-	-	-	-	7.5	-	-	-
29	-	-	-	-	7.0	-	-	-
30	5.0	-	-	-	7.0	-	-	-
31			-	-	-	-		
MEAN	-	-	-	-	7.6	-	-	-
Max/Min	-	-	-	-	-	-	-	-
Yearly Mean	-							
Max	-							
Min	-							

Table 8. Daily maximum and minimum water temperatures (°C), Nauyuk River, 1975.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	5.0	4.0	11.0	10.0	10.0	8.4
2	-	-	8.1	4.8	12.3	10.0	8.8	7.2
3	-	-	5.9	4.2	11.9	10.7	8.8	7.0
4	-	-	7.0	5.0	11.0	10.0	9.0	7.9
5	-	-	6.3	5.0	10.9	9.9	8.2	6.0
6	-	-	6.1	5.0	10.1	9.2	9.1	7.0
7	-	-	6.0	4.1	11.4	8.0	9.1	8.2
8	-	-	5.9	5.0	12.1	10.7	8.3	7.1
9	-	-	6.4	5.0	12.0	10.9	-	-
10	-	-	7.5	5.2	11.9	10.0	-	-
11	-	-	8.0	7.0	11.5	10.0	-	-
12	-	-	7.9	6.5	11.0	8.9	-	-
13	2.2	1.5	8.1	6.8	8.9	8.0	-	-
14	2.1	1.5	10.0	7.2	10.0	8.1	-	-
15	2.4	1.8	9.0	7.2	10.0	9.2	-	-
16	3.8	2.0	9.3	7.0	10.1	9.2	-	-
17	3.5	2.0	9.9	9.2	11.5	9.7	-	-
18	4.8	2.5	10.5	9.0	12.1	10.9	-	-
19	3.0	2.2	9.8	8.0	13.0	11.3	-	-
20	4.5	2.0	8.7	8.0	12.2	10.8	-	-
21	4.0	3.2	8.0	7.1	12.0	10.8	-	-
22	3.8	2.8	7.5	7.0	13.1	11.8	-	-
23	4.0	2.7	8.0	7.0	12.7	11.2	-	-
24	3.8	2.5	8.8	7.4	11.0	10.1	-	-
25	3.2	2.5	9.0	7.8	10.9	9.8	-	-
26	4.0	2.5	10.0	8.2	10.6	9.7	-	-
27	4.5	3.1	9.6	8.8	11.1	10.0	-	-
28	6.0	4.0	9.1	8.0	11.6	10.2	-	-
29	7.0	5.0	10.0	8.0	10.1	10.0	-	-
30	7.0	5.2	11.1	9.1	10.0	8.8	-	-
31			12.0	10.0	9.0	8.3		
MEAN	4.1	2.7	8.3	6.8	11.2	9.9	8.9	7.3
Max/Min	7.0	1.5	12.0	4.0	13.1	8.0	10.0	6.0
Yearly Mean	8.5							
Max	13.1							
Min	1.5							

Table 9. Daily maximum and minimum water temperatures (°C), Nauyuk River, 1976.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	-	-	10.2	9.0	8.2	7.2
2	-	-	-	-	9.0	8.0	7.8	6.8
3	-	-	-	-	8.6	7.4	7.2	6.6
4	-	-	-	-	8.6	7.4	7.0	6.4
5	-	-	-	-	8.6	7.8	-	-
6	-	-	4.0	3.0	8.0	7.4	-	-
7	-	-	4.2	2.4	7.4	6.8	-	-
8	-	-	4.6	2.0	7.8	6.8	-	-
9	-	-	4.6	3.0	8.6	7.6	-	-
10	-	-	3.2	2.4	8.8	8.0	-	-
11	-	-	4.2	2.4	8.2	7.8	-	-
12	-	-	5.2	2.6	8.6	7.6	-	-
13	-	-	7.0	4.4	9.8	7.8	-	-
14	-	-	7.0	3.2	9.0	8.0	-	-
15	-	-	6.0	3.0	8.6	7.6	-	-
16	-	-	6.6	3.4	8.2	8.0	-	-
17	-	-	4.8	3.2	8.8	8.0	-	-
18	-	-	4.0	3.0	8.8	8.4	-	-
19	-	-	6.8	3.2	9.2	8.4	-	-
20	-	-	5.8	2.8	9.4	8.8	-	-
21	-	-	9.0	4.4	8.8	8.0	-	-
22	-	-	5.0	4.4	8.0	7.6	-	-
23	-	-	4.8	3.8	7.6	7.0	-	-
24	-	-	5.8	4.2	7.4	6.8	-	-
25	-	-	5.2	4.0	6.8	6.4	-	-
26	-	-	6.0	4.8	7.0	6.0	-	-
27	-	-	6.0	5.0	7.0	6.4	-	-
28	-	-	6.6	5.2	7.2	6.2	-	-
29	-	-	8.6	6.0	7.2	6.4	-	-
30	-	-	12.4	8.6	8.0	6.4	-	-
31	-	-	9.8	6.0	8.4	6.8	-	-
MEAN	-	-	6.0	3.9	8.3	7.4	7.6	6.7
Max/Min	-	-	12.4	2.0	10.2	6.0	8.2	6.4
Yearly Mean	6.8							
Max	12.4							
Min	6.4							

Table 10. Daily maximum and minimum water temperatures (°C), Nauyuk River, 1977.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	5.2	3.6	11.8	10.0	9.6	8.2
2	-	-	5.6	4.4	10.8	9.0	8.6	7.6
3	-	-	4.4	3.6	10.6	8.0	8.6	7.4
4	-	-	4.0	3.0	11.2	9.6	8.2	6.4
5	-	-	6.0	3.6	12.4	9.0	-	-
6	-	-	7.8	4.8	11.2	8.8	-	-
7	-	-	7.4	5.0	9.8	8.8	-	-
8	-	-	7.6	4.0	10.0	9.2	-	-
9	-	-	6.2	3.2	10.2	9.0	-	-
10	-	-	5.0	3.8	11.0	9.0	-	-
11	-	-	6.0	4.0	9.8	8.6	-	-
12	-	-	5.2	4.6	10.2	9.0	-	-
13	-	-	6.4	4.8	11.8	9.0	-	-
14	-	-	7.0	5.2	10.2	8.4	-	-
15	-	-	6.0	4.8	10.4	9.0	-	-
16	-	-	6.4	4.4	10.0	9.4	-	-
17	-	-	6.4	4.2	10.2	9.0	-	-
18	-	-	7.6	4.6	9.6	8.6	-	-
19	-	-	8.6	6.2	9.8	8.8	-	-
20	-	-	9.8	7.8	9.2	7.0	-	-
21	3.0	2.0	9.0	8.0	9.2	7.0	-	-
22	2.8	2.2	9.8	7.6	9.2	7.4	-	-
23	3.0	2.2	9.6	7.4	8.2	8.0	-	-
24	3.8	2.4	7.6	5.8	9.0	7.8	-	-
25	2.4	2.0	9.6	7.4	9.4	8.0	-	-
26	4.8	2.0	9.8	9.0	9.2	8.0	-	-
27	4.2	3.8	10.0	9.0	8.8	8.0	-	-
28	3.8	3.0	11.2	9.0	9.6	8.2	-	-
29	3.8	2.8	10.6	9.2	8.8	8.4	-	-
30	4.6	3.2	9.8	8.2	10.6	7.0	-	-
31			10.8	8.6	8.4	8.2	-	-
MEAN	3.6	2.6	7.6	5.8	10.0	8.5	-	-
Max/Min	4.8	2.0	11.2	3.2	12.4	7.0	-	-
Yearly Mean	8.1							
Max	12.4							
Min	2.0							

Table 11. Daily maximum and minimum water temperatures (°C), Willow Creek, 1974.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	-	-	18.0	-	-	-
2	-	-	-	-	18.5	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	-	15.0	-	-	-
5	-	-	-	-	-	-	-	-
6	-	-	-	-	11.0	-	-	-
7	-	-	-	-	14.0	-	-	-
8	-	-	-	-	13.5	-	-	-
9	-	-	-	-	-	-	2.0	-
10	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-
18	-	-	18.7	-	-	-	-	-
19	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-
25	-	-	10.0	-	-	-	-	-
26	-	-	-	-	-	-	-	-
27	-	-	7.8	-	-	-	-	-
28	-	-	12.5	-	-	-	-	-
29	-	-	13.8	-	-	-	-	-
30	-	-	17.5	-	-	-	-	-
31			16.0	-	-	-		
MEAN	-	-	-	-	-	-	-	-
Max/Min	-	-	-	-	-	-	-	-
Yearly Mean	-	-	-	-	-	-	-	-
Max	-	-	-	-	-	-	-	-
Min	-	-	-	-	-	-	-	-

Table 12. Daily maximum and minimum water temperatures (°C), Willow Creek, 1975.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	-	-	16.4	11.6	6.2	4.0
2	-	-	-	-	18.0	10.8	4.8	2.8
3	-	-	15.2	-	12.2	7.0	4.2	1.4
4	-	-	17.8	12.2	11.0	8.4	6.6	2.4
5	-	-	16.2	12.4	14.4	7.8	9.6	5.0
6	-	-	10.8	7.6	14.0	8.2	8.8	6.2
7	6.0	-	10.8	5.6	15.0	7.0	7.0	2.8
8	3.0	-	12.2	8.0	14.2	10.2	2.8	0.0
9	4.0	-	15.8	10.2	13.8	9.4	-	-
10	5.0	0.5	15.0	8.2	14.8	9.6	-	-
11	9.0	3.0	14.2	11.0	14.8	11.4	-	-
12	10.0	-	14.2	9.4	11.4	4.6	-	-
13	11.0	-	10.6	7.2	7.2	3.2	-	-
14	-	-	13.6	7.6	11.2	4.4	-	-
15	-	-	15.8	9.8	13.0	6.8	-	-
16	-	-	16.4	10.2	14.8	8.8	-	-
17	12.0	-	12.4	9.8	15.8	10.4	-	-
18	-	-	13.8	8.8	16.2	11.6	-	-
19	12.0	-	9.2	7.8	16.0	11.6	-	-
20	-	-	10.0	6.2	15.8	10.2	-	-
21	-	-	9.0	5.0	15.0	12.2	-	-
22	-	-	8.4	4.6	-	-	-	-
23	-	-	9.8	5.8	-	-	-	-
24	-	-	10.0	5.4	-	-	-	-
25	-	-	11.8	5.8	-	-	-	-
26	11.5	-	12.2	7.4	-	-	-	-
27	-	-	14.8	7.4	-	-	-	-
28	-	-	15.6	9.2	-	-	-	-
29	-	-	15.4	11.0	8.8	5.4	-	-
30	-	-	16.2	8.8	8.0	4.4	-	-
31			14.8	11.0	5.8	2.8		
MEAN	8.3	-	13.2	8.3	13.2	8.2	6.3	3.0
Max/Min	12.0	-	17.8	4.6	18.0	2.8	9.6	0.0
Yearly Mean	11.7							
Max	18.0							
Min	0.0							

Table 13. Daily maximum and minimum water temperatures (°C), Willow Creek, 1976.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	11.6	5.4	15.0	10.8	9.6	4.8
2	-	-	11.0	5.8	15.8	7.8	9.0	4.4
3	-	-	9.2	7.0	11.0	5.4	-	-
4	-	-	12.0	5.2	13.8	7.0	-	-
5	-	-	11.0	9.0	12.8	8.8	-	-
6	-	-	9.0	8.0	9.8	7.2	-	-
7	-	-	9.4	7.0	8.2	6.8	-	-
8	-	-	10.0	6.2	9.4	5.2	-	-
9	-	-	13.0	7.2	10.2	6.0	-	-
10	-	-	11.4	7.0	12.4	7.6	-	-
11	-	-	9.8	5.4	12.2	8.0	-	-
12	-	-	10.8	7.6	14.6	9.8	-	-
13	-	-	13.2	7.8	16.8	11.8	-	-
14	1.0	-	14.4	9.8	12.8	8.0	-	-
15	2.4	0.0	14.8	10.2	10.6	6.4	-	-
16	1.6	0.0	13.2	10.0	8.8	6.8	-	-
17	1.4	0.0	14.2	9.2	10.2	8.4	-	-
18	3.6	0.0	12.4	10.0	11.6	9.2	-	-
19	3.4	0.0	14.8	9.4	12.6	10.0	-	-
20	3.0	0.0	14.6	10.8	11.2	8.2	-	-
21	3.0	0.0	16.6	12.0	8.4	6.8	-	-
22	6.2	1.0	17.6	12.4	7.0	5.0	-	-
23	9.8	1.8	17.2	12.6	6.0	3.2	-	-
24	8.2	4.6	18.4	13.8	5.4	4.6	-	-
25	10.4	4.8	17.0	12.8	3.8	2.4	-	-
26	12.2	5.4	16.4	11.4	4.0	1.8	-	-
27	12.0	7.8	16.4	11.2	4.0	2.0	-	-
28	13.6	8.8	17.6	11.6	5.6	0.4	-	-
29	11.0	6.2	19.2	13.8	5.0	2.4	-	-
30	10.8	5.6	19.4	15.2	7.6	1.6	-	-
31			19.8	15.6	9.4	3.4		
MEAN	6.7	2.7	14.0	9.7	9.9	6.2	-	-
Min/Max	13.6	0.0	19.8	5.2	16.8	0.4	-	-
Yearly Mean	10.8							
Max	19.8							
Min	0.0							

Table 14. Daily maximum and minimum water temperatures (°C), Willow Creek, 1977.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	11.6	7.0	13.8	10.4	5.6	4.2
2	-	-	10.8	8.2	12.2	8.8	5.2	2.0
3	-	-	14.0	8.8	11.2	7.0	5.0	1.4
4	-	-	14.2	10.2	14.0	-	5.8	3.0
5	-	-	13.4	9.6	12.8	10.0	6.2	4.4
6	-	-	14.6	9.8	11.4	8.4	5.0	1.8
7	-	-	14.8	11.4	9.8	8.0	3.8	0.4
8	-	-	13.0	10.0	11.4	7.8	7.2	3.0
9	-	-	10.0	7.4	10.2	8.8	6.0	5.0
10	-	-	8.4	6.6	10.0	6.8	5.2	4.8
11	2.0	-0.4	10.6	7.4	8.6	5.6	5.2	4.4
12	2.4	-0.2	10.6	8.0	8.4	6.4	-	-
13	4.4	0.2	13.0	9.2	10.0	6.2	-	-
14	4.2	0.2	13.4	10.2	8.0	6.0	-	-
15	5.2	0.2	13.8	11.6	8.6	6.8	-	-
16	3.0	1.2	13.6	10.8	8.6	6.2	-	-
17	5.0	0.4	15.0	11.6	9.0	6.8	-	-
18	8.0	1.8	14.0	11.8	7.6	6.4	-	-
19	10.2	3.2	13.0	10.4	8.0	5.4	-	-
20	12.0	5.6	12.6	10.0	6.8	4.0	-	-
21	13.0	8.0	12.6	10.2	6.8	3.4	-	-
22	12.8	7.4	15.0	10.0	8.0	4.6	-	-
23	13.6	8.8	17.0	11.8	6.0	3.4	-	-
24	15.8	9.4	16.6	12.2	10.0	4.6	-	-
25	10.4	7.2	15.0	11.2	10.6	5.2	-	-
26	10.6	5.4	11.2	9.0	10.6	5.6	-	-
27	8.6	6.4	12.6	8.8	8.6	6.0	-	-
28	7.6	5.0	14.2	9.4	11.4	6.0	-	-
29	9.6	4.8	12.6	9.0	8.6	7.2	-	-
30	9.6	6.6	10.0	6.6	10.4	6.8	-	-
31			12.8	6.6	7.6	4.6		
MEAN	8.4	4.1	13.0	9.5	9.6	6.2	5.5	3.1
Max/Min	15.8	-0.4	17.0	6.6	14.0	3.4	7.2	0.4
Yearly Mean	10.0							
Max	17.0							
Min	-0.4							

Table 15. Chemical analyses results from stations on Nauyuk Lake, 12 July 1974. (IF = inflow, OF = outflow).

Analysis	SITE Willow Creek IF	NW Arm IF	NE Arm IF	Sta 002 10m	Sta 002 34m	Nauyuk River OF
TDN ug L^{-1}	320	310	521	240	220	260
TDP ug L^{-1}	2.4	0.7	2.5	1.9	1.1	2.0
Part. N ug L^{-1}	43	35	22	30	35	39
Part. P ug L^{-1}	8.4	3.4	2.8	5.3	4.6	6.5
Part. C ug L^{-1}	280	220	200	220	230	270
Susp. Seston mg L^{-1}	2.2	0.1	1.6	2.2	0.9	2.7
Cond umho cm^{-1}	316	201	326	361	363	352
pH	7.75	7.69	7.89	7.92	7.92	7.96
Chl-a ug L^{-1}	0.70	0.25	0.08	1.25	1.10	1.53
HCO_3 mg L^{-1}	104.9	85.1	114.5	104.8	106.3	104.2
Si mg L^{-1}	0.18	0.46	0.97	0.84	0.89	0.83
Cl mg L^{-1}	43.25	18.01	43.60	56.01	56.01	56.01
SO_4 mg L^{-1}	5.76	5.19	6.05	8.93	8.93	8.65
Ca mg L^{-1}	19.40	14.99	23.29	21.48	21.60	21.00
Mg mg L^{-1}	13.10	10.31	15.21	14.39	14.51	13.99
Na mg L^{-1}	22.99	8.74	18.90	28.51	28.74	27.36
K mg L^{-1}	1.37	0.55	18.89	2.19	2.15	2.11

Table 16. Chemical analyses results from Station #002, Nauyuk Lake, 3 March 1975.

Depth (m)	Analysis (mg L^{-1})					
	Cl	SO^4	Na	K	Mg	Ca
0	74.5	10.8	36.3	2.76	18.3	13.0
5	69.9	9.6	33.6	2.59	16.9	15.0
10	67.5	9.0	33.2	2.57	16.7	13.1
15	68.0	9.2	33.8	2.57	16.7	13.0
20	67.5	8.8	33.6	2.60	16.8	14.2
25	70.0	9.8	35.0	2.68	16.8	16.0
30	70.5	10.2	34.8	2.65	17.4	15.7
35	71.0	9.2	35.6	2.65	17.4	14.3
40	73.0	9.8	36.7	2.77	17.8	15.2

Table 17. Daily maximum and minimum air temperatures (°C), 1976.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	17.8	2.8	12.8	5.5	11.7	3.3
2	-	-	15.0	5.0	-	4.4	12.2	3.3
3	-	-	12.8	5.0	-	-	8.3	3.9
4	-	-	17.8	6.1	-	-	7.8	5.0
5	-	-	8.9	3.9	-	-	6.7	4.4
6	-	-	8.3	5.0	-	-	6.7	3.9
7	-	-	7.2	2.2	-	-	6.1	1.7
8	-	-	9.4	1.1	-	-	5.0	1.7
9	-	-	12.8	2.2	8.3	3.3	-	-
10	3.9	-	13.3	5.0	10.5	4.4	-	-
11	3.3	-1.1	9.4	3.3	13.9	5.5	-	-
12	1.7	-1.7	13.3	3.9	16.7	7.2	-	-
13	3.3	-4.4	13.9	3.3	18.3	7.2	-	-
14	10.0	-2.8	18.3	5.0	-	3.9	-	-
15	12.8	1.1	20.5	6.7	8.9	-	-	-
16	5.5	1.1	14.4	7.8	13.3	-0.5	-	-
17	3.9	0.0	11.7	5.0	13.9	8.3	-	-
18	5.0	-0.5	12.2	3.9	13.9	7.8	-	-
19	5.5	0.6	15.0	3.9	13.9	8.9	-	-
20	5.0	-1.7	17.8	6.1	7.2	4.4	-	-
21	4.4	-1.7	18.3	8.3	7.2	2.8	-	-
22	9.4	-1.1	15.0	5.5	7.2	3.3	-	-
23	14.4	0.6	17.2	8.9	8.9	0.0	-	-
24	6.7	1.7	18.3	10.5	8.3	2.2	-	-
25	13.3	0.6	17.8	8.9	2.2	-0.5	-	-
26	21.1	3.3	16.1	8.3	2.2	-0.5	-	-
27	15.0	2.8	16.1	7.2	2.2	-0.5	-	-
28	16.1	5.5	18.9	8.9	3.9	-1.1	-	-
29	7.2	0.6	20.5	11.1	5.0	1.1	-	-
30	7.8	1.7	21.7	11.1	8.9	0.6	-	-
31			20.5	11.1	13.9	2.2		
MEAN	8.3	0.2	15.2	6.0	9.6	3.3	8.0	3.4
Max/Min	21.1	-4.4	21.7	1.1	16.7	-1.1	12.2	1.7
Yearly Mean	11.2							
Max	21.7							
Min	-4.4							

Table 18. Daily maximum and minimum air temperatures (°C), 1977.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	11.1	2.2	16.1	8.3	9.5	4.0
2	-	-	12.8	3.9	12.2	6.1	-	-
3	-	-	11.7	5.0	13.9	5.0	-	-
4	-	-	11.1	5.5	16.1	7.2	-	-
5	-	-	12.8	3.9	13.3	6.7	-	-
6	-	-	15.0	3.9	12.8	6.7	-	-
7	-	-	16.7	7.2	11.1	6.1	-	-
8	-	-	12.2	6.1	13.3	6.7	-	-
9	-	-	5.5	3.3	11.1	5.5	-	-
10	8.3	-	7.8	3.3	9.4	3.3	-	-
11	9.4	0.0	9.4	3.3	8.9	2.8	-	-
12	9.4	0.0	12.8	4.4	8.9	5.0	-	-
13	13.3	3.9	13.9	7.2	11.7	5.0	-	-
14	13.3	2.8	14.4	7.2	9.4	1.7	-	-
15	18.3	2.8	15.0	7.8	11.1	5.0	-	-
16	6.1	0.6	16.7	7.8	11.1	4.4	-	-
17	10.5	-0.5	17.2	7.2	13.3	7.2	-	-
18	11.7	0.0	13.3	8.9	7.2	3.9	-	-
19	13.9	2.8	13.3	6.7	8.3	3.3	-	-
20	18.9	5.0	-	5.5	8.3	1.7	-	-
21	17.8	5.5	14.4	6.1	8.3	2.2	-	-
22	17.2	5.0	20.0	5.5	7.2	1.7	-	-
23	20.0	7.2	20.5	7.2	8.3	1.7	-	-
24	20.0	8.3	18.9	9.4	11.1	3.3	-	-
25	10.3	2.2	11.7	5.5	11.7	3.9	-	-
26	9.3	1.5	14.4	7.8	11.7	3.9	-	-
27	8.4	2.0	15.0	6.7	10.5	3.3	-	-
28	7.1	0.3	17.8	7.2	11.1	5.0	-	-
29	7.2	2.1	15.0	5.0	8.9	4.4	-	-
30	10.2	1.4	12.2	3.3	10.0	3.9	-	-
31			15.0	4.4	9.4	3.9		
MEAN	12.0	2.6	13.9	5.7	10.8	4.4	-	-
Max/Min	20.0	-0.5	20.5	2.2	16.1	1.7	-	-
Yearly Mean	12.2							
Max	20.5							
Min	-0.5							

Table 19. Daily maximum and minimum air temperatures (°C), 1978.

DATE	JUNE		JULY		AUGUST		SEPTEMBER	
	Max	Min	Max	Min	Max	Min	Max	Min
1	-	-	10.5	1.1	12.8	2.8	-	-1.7
2	-	-	7.8	-0.5	16.7	2.8	5.5	0.0
3	-	-	7.8	0.6	-	-	6.1	2.2
4	-	-	5.5	0.6	15.5	9.4	7.8	1.7
5	-	-	7.2	-0.5	17.2	5.0	7.2	-1.7
6	-	-	6.1	-0.5	6.7	5.0	5.0	-1.1
7	-	-	12.8	0.0	7.2	3.9	5.0	0.6
8	-	-	15.0	2.8	9.4	1.1	5.0	1.7
9	-	-	13.3	4.4	6.7	2.8	6.1	1.7
10	-	-	9.4	2.8	6.1	0.6	6.1	2.8
11	-	-	9.4	3.3	5.0	3.3	-	-
12	-	-	10.5	2.2	6.7	0.6	9.4	2.2
13	-	-	6.7	3.3	11.7	0.0	2.8	-0.5
14	-	-	6.7	2.2	11.1	2.8	-	-
15	-	-	6.1	2.2	7.2	1.1	-	-
16	-	-	9.4	1.1	8.9	-0.5	-	-
17	-	-	9.4	3.9	6.1	0.0	-	-
18	-	-	5.0	1.7	7.8	1.1	-	-
19	-	-	9.4	1.7	7.8	-0.5	-	-
20	1.7	-	10.5	3.9	6.7	1.1	-	-
21	3.9	-1.7	14.4	2.8	11.1	2.8	-	-
22	3.9	-1.7	14.4	3.3	13.9	3.3	-	-
23	4.4	-1.7	14.4	4.4	11.1	4.4	-	-
24	2.2	-1.7	7.2	3.9	9.4	3.9	-	-
25	1.1	-1.7	8.9	2.8	9.4	1.7	-	-
26	2.2	-1.7	11.7	3.9	10.0	1.1	-	-
27	5.0	-1.7	12.2	3.3	3.9	0.0	-	-
28	7.2	-0.5	13.9	2.8	5.0	-0.5	-	-
29	10.5	-0.5	9.4	2.2	9.4	0.6	-	-
30	9.4	-0.5	9.4	2.2	3.9	-	-	-
31			8.3	2.8	5.0	-2.2	-	-
MEAN	4.7	-1.3	9.8	2.3	8.9	2.0	6.0	0.7
Max/Min	10.5	-1.7	15.0	-0.5	17.2	-2.2	9.4	-1.7
Yearly Mean	8.3							
Max	17.2							
Min	-2.2							

Table 20. Barometric pressure at sea level (kPa), 1800 GMT (1200 MDT), 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	100.99	101.52	101.14
2	-	101.22	101.36	101.53
3	-	101.38	101.92	102.26
4	-	101.69	101.55	101.73
5	102.19	102.33	102.04	101.35
6	102.20	102.37	101.61	102.23
7	102.26	102.67	101.60	101.60
8	102.20	101.85	102.10	101.01
9	102.32	101.35	101.41	100.94
10	102.36	101.67	101.12	-
11	102.13	101.61	101.39	-
12	102.24	101.76	102.06	-
13	102.23	101.63	102.37	-
14	101.89	101.36	102.21	-
15	101.51	101.24	102.02	-
16	101.12	101.31	101.94	-
17	102.53	101.12	101.01	-
18	102.39	100.82	101.61	-
19	101.96	101.20	102.04	-
20	101.08	101.12	102.07	-
21	100.99	101.49	102.34	-
22	100.55	101.79	101.86	-
23	100.13	101.70	102.23	-
24	99.70	101.72	102.24	-
25	99.47	101.53	101.43	-
26	99.90	101.43	100.90	-
27	100.05	102.05	100.86	-
28	100.04	101.72	100.87	-
29	100.29	100.74	100.65	-
30	100.35	101.37	100.71	-
31		101.72	101.06	-

Table 21. Barometric pressure at sea level (kPa), 1800 GMT (1200 MDT), 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	102.13	101.90	102.04
2	-	102.22	101.11	102.02
3	-	102.10	100.79	101.88
4	-	102.01	101.36	101.67
5	-	102.65	100.56	101.19
6	-	102.07	100.36	101.64
7	-	102.24	101.02	102.67
8	-	102.05	101.54	102.94
9	-	100.45	100.93	102.69
10	-	100.82	101.08	102.16
11	-	101.31	100.61	101.68
12	-	101.11	101.04	-
13	-	100.76	100.34	-
14	-	100.71	101.30	-
15	-	100.12	100.79	-
16	-	100.54	100.90	-
17	-	101.26	101.03	-
18	-	100.98	101.75	-
19	-	101.35	101.83	-
20	-	101.14	101.46	-
21	-	101.14	100.46	-
22	101.92	100.85	100.61	-
23	100.31	100.43	101.14	-
24	100.53	100.35	100.88	-
25	101.30	100.71	101.52	-
26	101.18	100.81	100.50	-
27	101.04	101.49	100.90	-
28	101.53	101.00	101.76	-
29	101.58	101.33	101.55	-
30	101.65	100.71	102.05	-
31		101.12	102.12	-

Table 22. Barometric pressure at sea level (kPa), 1800 GMT (1200 MDT), 1979.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	101.49	101.93	-
2	-	102.17	101.82	-
3	-	101.97	101.43	-
4	-	101.31	100.76	-
5	-	101.24	100.14	-
6	-	99.89	100.81	-
7	-	99.67	-	-
8	-	100.87	-	-
9	-	101.45	-	-
10	-	101.31	-	-
11	-	101.14	-	-
12	-	101.14	-	-
13	-	101.87	-	-
14	-	102.30	-	-
15	-	101.83	-	-
16	100.41	101.54	-	-
17	100.96	101.30	-	-
18	101.42	101.65	-	-
19	101.81	101.48	-	-
20	102.34	101.78	-	-
21	102.50	101.96	-	-
22	102.34	101.60	-	-
23	101.06	102.22	-	-
24	101.47	101.99	-	-
25	100.53	101.12	-	-
26	101.13	100.93	-	-
27	101.36	101.15	-	-
28	101.94	101.36	-	-
29	101.88	101.18	-	-
30	101.70	101.23	-	-
31		100.95	-	-

Table 23. Total daily precipitation (mm), 1976.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	-	0.8	-
2	-	-	-	-
3	-	3.3	-	T
4	-	-	-	0.3
5	-	4.3	-	0.3
6	-	1.5	-	T
7	-	20.3	-	T
8	-	-	3.3	-
9	-	-	-	-
10	0.5[S]	5.3	-	-
11	-	-	-	-
12	-	-	7.9	-
13	-	-	2.8	-
14	-	-	-	-
15	2.8	-	-	-
16	-	-	-	-
17	-	-	0.6	-
18	-	-	-	-
19	-	-	-	-
20	-	-	T	-
21	-	-	-	-
22	-	-	T	-
23	3.8	-	-	-
24	-	-	T	-
25	-	-	-	-
26	-	-	-	-
27	-	-	-	-
28	0.8	-	-	-
29	7.9	-	-	-
30	4.6	-	-	-
31		1.0	-	
TOTAL	20.4	35.7	14.6	0.6

T = Trace
s = Snow

Table 24. Total daily precipitation (mm), 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	-	1.1	-
2	-	-	-	0.5
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	0.4	-
10	-	-	-	-
11	-	0.9	-	-
12	-	-	-	-
13	-	0.5	0.4	-
14	-	0.4	-	-
15	-	-	-	-
16	-	-	-	-
17	-	2.8	0.9	-
18	-	-	-	-
19	-	-	-	-
20	-	-	-	-
21	-	-	0.3	-
22	-	-	-	-
23	-	-	0.5	-
24	6.2	0.5	-	-
25	-	-	-	-
26	-	-	-	-
27	-	-	-	-
28	-	-	-	-
29	-	-	14.7	-
30	-	-	3.9	-
31		-	-	
TOTAL	6.2	5.1	22.2	0.5

T = Trace

Table 25. Total daily precipitation (mm), 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	-	-	-
2	-	-	-	-
3	-	T	T	-
4	-	-	-	-
5	-	-	-	2.3
6	-	-	-	0.8
7	-	-	4.6	-
8	-	-	2.0	-
9	-	T	0.3	-
10	-	1.0	T	-
11	-	0.3	T	-
12	-	-	-	3.6
13	-	T	-	-
14	-	1.8	2.3	-
15	-	1.5	-	-
16	-	-	1.5	-
17	-	0.8	-	-
18	-	1.8	T	-
19	-	-	-	-
20	-	-	-	-
21	-	-	-	-
22	-	-	T	-
23	7.6	0.3	2.3	-
24	T	0.3	1.3	-
25	-	-	-	-
26	-	-	1.0	-
27	-	-	-	-
28	-	0.3	-	-
29	T	-	-	-
30	-	2.3	-	-
31		-	-	
TOTAL	7.6	10.4	17.6	4.4

T = Trace

Table 26. Mean daily wind speed ($km \cdot h^{-1}$) and direction, 1976.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	SE 29.6	NW 38.9	SE 27.8
2	-	NW 3.7	NW 51.8	SE 22.2
3	-	SE 31.5	-	SE 33.3
4	-	SE 16.7	-	SE 37.0
5	-	NW 22.2	-	NE 11.1
6	-	NW 7.4	-	N 11.1
7	-	SE 1.9	-	N 18.5
8	-	0	-	NE 31.5
9	-	SE 9.3	NW 14.8	N 51.8
10	-	SE 11.1	SE 3.7	-
11	-	SE 14.8	SE 11.1	-
12	-	NW 14.8	SE 37.0	-
13	-	NW 5.6	SE 27.8	-
14	-	SE 9.3	NE 20.4	-
15	0	NW 5.6	-	-
16	NW 46.3	NE 11.1	SE 33.3	-
17	0	SE 13.0	-	-
18	SE 5.6	SE 13.0	SE 7.4	-
19	N 14.8	NW 7.4	SE 22.2	-
20	N 7.4	NW 11.1	NE 22.2	-
21	NW 18.5	SE 3.7	NE 7.4	-
22	3.7	SE 11.1	NW 55.5	-
23	0	SE 11.1	NW 48.1	-
24	NW 25.9	SE 11.1	NW 38.9	-
25	NW 11.1	SE 22.2	NW 27.8	-
26	SE 9.3	SE 33.3	E 11.1	-
27	0	SE 22.2	SE 11.1	-
28	NW 40.7	SE 18.5	SE 7.4	-
29	NW 5.6	SE 7.4	N 22.2	-
30	SE 5.6	SE 7.4	NW 9.3	-
31		NW 29.6	SE 7.4	-
MEAN	12.2	13.4	22.4	27.1

Table 27. Mean daily wind speed ($km \cdot h^{-1}$) and direction, 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	NE 7.4	NW 13.0	-
2	-	NE 1.9	NW 16.7	SE 25.9
3	-	NW 9.3	NW 20.4	-
4	-	NW 11.1	SE 5.6	-
5	-	NW 11.1	NW 18.5	-
6	-	NW 3.7	NW 22.2	-
7	-	NE 9.3	SE 33.3	-
8	-	NE 18.5	SE 3.7	-
9	-	NE 24.1	NW 22.2	-
10	-	NE 11.1	NW 9.3	-
11	NW 29.6	NW 7.4	NW 62.9	-
12	NW 20.4	N 5.6	NW 11.1	-
13	NW 11.1	SW 3.7	N 16.7	-
14	NW 25.9	NW 16.7	NW 18.5	-
15	SE 16.7	NW 9.3	NW 11.1	-
16	NE 29.6	NW 18.5	SE 3.7	-
17	NW 14.8	NW 31.5	SE 13.0	-
18	SE 9.3	N 7.4	NW 37.0	-
19	S 18.5	NW 11.1	NW 20.4	-
20	S 11.1	NW 24.1	NW 37.0	-
21	SE 9.3	NW 40.7	NW 33.3	-
22	SE 7.4	NW 7.4	SE 25.9	-
23	SE 7.4	SE 11.1	SE 37.0	-
24	S 9.3	SE 11.1	SE 18.5	-
25	NW 16.7	NW 18.5	SE 25.9	-
26	NE 16.7	NW 14.8	SE 18.5	-
27	NW 40.7	NW 22.2	SE 11.1	-
28	NW 37.0	NW 18.5	SE 22.2	-
29	NW 18.5	NW 29.6	SE 25.9	-
30	NW 13.0	NW 33.3	NW 14.8	-
31		NW 18.5	SE 33.3	
MEAN	18.1	15.1	21.4	-

Table 28. Mean daily wind speed ($km \cdot h^{-1}$) and direction, 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	S 22.2	N 18.5	NE 5.6
2	-	S 25.9	N 24.1	0.0
3	-	S 25.9	-	W 5.6
4	-	S 18.5	NW 27.8	SE 1.9
5	-	N 18.5	N 1.9	N 3.7
6	-	E 14.8	NE 11.1	N 22.2
7	-	N 16.7	N 5.6	SW 11.1
8	-	N 9.3	N 18.5	S 29.6
9	-	N 25.9	N 20.4	S 20.4
10	-	N 25.9	N 25.9	S 3.7
11	-	N 16.7	N 31.5	-
12	-	E 9.3	N 24.1	N 3.7
13	-	N 3.7	S 20.4	S 20.4
14	-	N 20.4	S 16.7	-
15	-	N 25.9	N 25.9	-
16	-	S 33.3	N 44.4	-
17	-	N 18.5	N 25.9	-
18	-	N 14.8	N 18.5	-
19	-	S 20.4	N 25.9	-
20	22.2	N 20.4	S 9.3	-
21	N 11.1	N 27.8	S 9.3	-
22	S 16.7	S 3.7	N 14.8	-
23	SE 20.4	N 5.6	N 16.7	-
24	N 37.0	N 16.7	N 24.1	-
25	S 11.1	N 24.1	S 14.8	-
26	S 20.4	S 9.3	N 44.4	-
27	S 11.1	N 5.6	N 22.2	-
28	S 13.0	N 24.1	S 7.4	-
29	S 13.0	N 11.1	S 14.8	-
30	S 16.7	N 13.0	-	-
31		N 27.8	S 3.7	-
MEAN	17.5	17.9	19.6	10.7

Table 29. Mean daily cloud cover in tenths, 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	10.0	10.0	10.0
2	-	10.0	10.0	10.0
3	-	0.0	9.0	-
4	-	1.5	5.0	-
5	-	0.0	9.5	-
6	-	0.0	10.0	-
7	-	8.5	10.0	-
8	-	9.5	9.5	-
9	-	10.0	10.0	-
10	-	10.0	9.0	-
11	1.0	9.0	10.0	-
12	9.5	10.0	10.0	-
13	5.0	8.0	10.0	-
14	4.0	10.0	10.0	-
15	8.0	10.0	10.0	-
16	10.0	9.0	9.5	-
17	7.0	10.0	6.0	-
18	0.0	10.0	10.0	-
19	0.0	7.5	9.5	-
20	1.0	9.5	4.5	-
21	3.0	10.0	10.0	-
22	7.5	0.0	0.0	-
23	9.0	0.0	10.0	-
24	9.0	9.0	5.0	-
25	10.0	10.0	0.0	-
26	9.0	9.5	7.5	-
27	10.0	10.0	10.0	-
28	9.5	0.0	3.0	-
29	9.5	10.0	10.0	-
30	9.5	0.0	4.5	-
31		10.0	10.0	
MEAN	6.6	7.1	8.1	-

Table 30. Mean daily cloud cover in tenths, 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	0.0	10.0	1.0
2	-	0.5	9.0	10.0
3	-	10.0	-	9.0
4	-	0.0	6.0	10.0
5	-	6.0	10.0	10.0
6	-	1.0	-	10.0
7	-	0.5	10.0	10.0
8	-	2.0	1.0	10.0
9	-	10.0	9.5	6.0
10	-	10.0	10.0	7.5
11	-	10.0	10.0	-
12	-	7.0	1.0	1.0
13	-	10.0	9.5	10.0
14	-	9.5	7.5	-
15	-	10.0	1.0	-
16	-	10.0	10.0	-
17	-	10.0	2.0	-
18	-	10.0	2.0	-
19	-	9.0	7.0	-
20	10.0	10.0	1.0	-
21	8.0	1.0	3.0	-
22	9.0	2.5	1.0	-
23	10.0	1.0	8.0	-
24	5.0	9.5	8.0	-
25	1.0	10.0	2.0	-
26	8.0	10.0	10.0	-
27	0.5	0.5	8.0	-
28	10.0	10.0	8.0	-
29	7.0	9.5	3.0	-
30	0.0	10.0	-	-
31		9.5	0.0	-
MEAN	6.2	6.7	6.0	7.9

Table 31. Total daily solar radiation ($MJ \cdot m^{-2} \cdot d^{-1}$), 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	22.52	16.79	3.82
2	-	19.68	7.91	7.39
3	-	31.08	12.98	4.41
4	-	29.50	17.45	6.05
5	-	22.19	13.96	10.14
6	-	24.42	11.07	6.65
7	-	23.12	11.13	7.63
8	-	15.87	7.91	-
9	-	11.72	15.87	-
10	-	13.30	7.63	-
11	-	16.79	8.23	-
12	-	14.28	13.30	-
13	-	17.45	9.21	-
14	-	20.61	7.31	-
15	-	15.21	8.56	-
16	-	20.28	7.63	-
17	-	17.12	7.91	-
18	-	13.30	-	-
19	24.10	21.86	-	-
20	24.17	16.79	-	-
21	26.33	17.12	-	-
22	20.28	24.70	-	-
23	23.44	26.61	-	-
24	24.42	21.54	-	-
25	-	14.56	-	-
26	26.01	12.70	-	-
27	20.28	21.54	-	-
28	13.96	19.68	-	-
29	18.37	15.87	10.14	-
30	17.45	23.12	4.14	-
31		20.61	6.32	
TOTAL	-	605.12	-	-
MEAN	21.71	19.52	10.25	6.54

Table 32. Total daily solar radiation ($MJ \cdot m^{-2} \cdot d^{-1}$), 1978.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	29.50	20.94	11.07
2	-	28.84	22.84	9.21
3	-	26.33	21.54	8.23
4	-	20.61	24.42	8.26
5	-	27.59	23.44	7.80
6	-	17.77	13.30	7.89
7	-	27.26	12.70	8.89
8	-	30.42	16.79	9.21
9	-	26.33	13.63	10.14
10	-	13.30	14.88	-
11	-	18.37	14.56	-
12	-	20.28	15.21	-
13	-	16.03	15.78	-
14	-	16.47	17.12	-
15	-	14.88	11.72	-
16	-	20.94	14.56	-
17	-	16.47	13.63	-
18	-	13.30	17.77	-
19	-	18.37	18.37	-
20	-	18.05	15.21	-
21	26.33	25.02	13.30	-
22	26.61	27.91	17.12	-
23	17.45	20.94	14.88	-
24	19.35	14.88	9.49	-
25	20.94	17.12	12.05	-
26	18.05	19.03	10.79	-
27	23.44	22.93	11.39	-
28	27.59	22.84	11.07	-
29	22.84	20.94	12.05	-
30	29.50	19.03	11.72	-
31		21.26	8.56	-
TOTAL	232.09	653.37	470.29	80.58
MEAN	23.23	21.10	15.16	8.94

Table 33. Total hours of bright sunshine per day, 1977.

DATE	JUNE	JULY	AUGUST	SEPTEMBER
1	-	7.2	0.8	-
2	-	5.0	8.3	-
3	-	21.1	11.9	-
4	-	18.4	2.0	-
5	-	16.4	4.3	-
6	-	17.9	0.6	-
7	-	10.3	0	-
8	-	3.5	0.7	-
9	-	0	0.2	-
10	4.8	0	5.8	-
11	13.8	2.7	0.1	-
12	9.2	3.9	0	-
13	20.6	5.4	4.9	-
14	18.4	7.6	0.1	-
15	16.6	5.0	0.2	-
16	0	5.5	3.1	-
17	16.6	1.1	0.9	-
18	19.6	0.4	1.0	-
19	21.3	3.0	1.4	-
20	18.7	4.0	2.7	-
21	18.6	5.0	2.7	-
22	13.5	19.0	3.2	-
23	11.3	18.2	0.6	-
24	9.2	6.8	7.8	-
25	0.9	3.6	12.2	-
26	17.5	1.7	5.4	-
27	8.3	8.3	1.1	-
28	0.1	12.0	6.8	-
29	3.6	8.8	5.4	-
30	0.3	13.9	0.3	-
31		10.8	-	
TOTAL	-	246.5	94.5	-
MEAN	11.6	7.9	3.2	-
DAILY MAXIMUM	21.3	21.1	12.2	
DAILY MINIMUM	0.0	0.0	0.0	